FINAL

Amendment 13

To the

Northeast Multispecies Fishery Management Plan

Including a

Final Supplemental Environmental Impact Statement and an Initial Regulatory Flexibility Analysis

VOLUME I
Management Alternatives and Impacts

Prepared by the
New England Fishery Management Council
National Marine Fisheries Service

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COVER SHEET

RESPONSIBLE AGENCIES:

Assistant Administrator for Fisheries
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Washington, D.C. 20235

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PROPOSED ACTIONS:

Adoption, approval, and implementation of Amendment 13 to the Northeast Multispecies Fishery Management Plan.

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ABSTRACT:

The New England Fishery Management Council and the NOAA Assistant Administrator for Fisheries propose to adopt, approve, and implement Amendment 13 to the Northeast Multispecies Fishery Management Plan (FMP) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (the Act). The FSEIS presents the details of a management program designed to ensure compliance with the Act. It proposes measures to implement formal rebuilding programs for overfished stocks and to end overfishing on those stocks where it is occurring. Appropriate management measures will be adopted to implement these rebuilding programs. In addition, the Amendment will adopt measures to reduce excess harvesting capacity in the fishery and measures to minimize, to the extent possible, the adverse impacts of fishing on esential fish habitat. Finally, the Amendment includes measures that address a wide range of other management issues.

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EXECUTIVE SUMMARY

Current Status of the Regulations and Need for this Amendment

The Northeast multispecies fishery (Atlantic cod, witch flounder, American plaice, yellowtail flounder, haddock, pollock, winter flounder, windowpane flounder, redfish, white hake, Atlantic halibut, and ocean pout) is currently managed through limitations on the number of days fished (days-at-sea; DAS), closed areas, trip limits, minimum fish sizes, and gear restrictions. The regulations implemented to manage the fishery are governed by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; M-S Act). The M-S Act mandates that action be taken if the size of a fish stock declines below a specified level ("overfished"), or if the annual harvest rate is too high ("overfishing"). Although the numbers of fish of many of the 12 groundfish species (20 stocks) have increased substantially in recent years and harvest rates have gradually declined, for many stocks the rate of increase must be accelerated to comply with the law, and for other stocks the harvest rate must be reduced. The stocks needing the largest reduction in fishing mortality are Gulf of Maine cod, Georges Bank cod, Cape Cod/Gulf of Maine yellowtail flounder, Southern New England/Mid-Atlantic yellowtail flounder, Southern New England/Mid Atlantic winter flounder, white hake, and American plaice.

In December 2001, as a result of a lawsuit (*Conservation Law Foundation et al. v. Donald Evans et al*) against the National Marine Fisheries Service (NMFS), a Federal Judge ruled that the Northeast Multispecies FMP does not comply with the M-S Act and ordered that Amendment 13 measures be implemented by August 22, 2003. The Judge further ordered that measures agreed to by certain parties in a Settlement Agreement be implemented during the interim. One of the most significant measures implemented during this interim period, beginning August 1, 2002, was a freeze on the number of DAS to the maximum level used during recent years (fishing years 1996-2000) and a 20% DAS reduction from that level. Subsequent to the initial ruling, the judge extended the deadline for implementing new measures to May 1, 2004.

In addition to this lawsuit, Amendment 13 includes alternatives to address the court-ordered remedy in the case of *American Oceans Campaign et al. v Daley et al*. In this case the court ruled in this lawsuit that elements of the amendment adopted to comply with the essential fish habitat provisions of the M-S Act were not in compliance with the National Environmental Policy Act (NEPA). Most of these alternatives were previously published and distributed for public comment as the *Draft Environmental Impact Statement for the Essential Fish Habitat Components of Amendment 13 to the Northeast Multipsecies Fishery Management Plan*. The proposed alternatives and impact analysis from that document have been incorporated into this SEIS.

The Purpose of this Document

This document provides information to the New England Fishery Management Council (Council), the public, and NMFS in order to select the best method of managing the fishery in accordance with the law. This Supplemental Environmental Impact Statement (SEIS) provides detailed information on the proposed action that has been developed by the Council to achieve the objectives of Amendment 13. It also includes information on the alternatives to the proposed action that were considered. The principal objectives of the amendment include rebuilding overfished stocks, ending overfishing, reducing unused effort in the fishery, addressing administrative issues, maintaining flexibility in the fishery, reducing bycatch, and minimizing the impact of the fishery on fish habitat and protected species (such as whales and turtles). In addition, this Amendment responds to the requirements of the court orders in the lawsuits of *Conservation Law Foundation et al. v. Donald Evans et al* and *American Oceans Campaign et al. v Daley et al.* As noted in the previous paragraph, this Amendment incorporates and expands on the *Draft Environmental Impact Statement for the Essential Fish Habitat Components of Amendment 13 to the Northeast Multispecies Fishery Management Plan.* This document describes and compares the various alternatives and provides analyses of their impacts. There are three major categories of impacts - biological, economic, and social impacts – but impacts on bycatch, habitat, and enforcement are also described. This Executive Summary highlights the major elements of the proposed action and includes a summary table of those measures. It does not list alternatives not adopted. Please see the applicable sections of the amendment for specific details.

Changes from the Draft Amendment and DSEIS

This final amendment and FSEIS differ in several ways from the draft amendment and DSEIS. First, the proposed action is identified. Second, the document has been edited and re-organized to clearly identify the proposed action and alternatives not selected. Finally, additional analyses and discussion have been added to support the proposed actions.

The proposed action are based on the alternatives considered and public comments. One major change resulted from public comments. The Council originally considered choosing one rebuilding strategy for all overfished stocks. The proposed action uses a combination of the phased and adaptive strategies, further modified based on the management measures selected by the Council. This decision to combine rebuilding strategies also resulted in changes to the proposed management measures. These changes are further described in following sections.

With respect to additional analyses, this document includes biological and economic analyses of the combined rebuilding strategies and the management measures implementing those strategies. In addition, in response to public comments, it includes a discussion of the impacts of steaming time and reduced days-at-sea allocations on vessels that claim Maine as a homeport. Some of the habitat analyses have also been revised to incorporate public comments. An initial regulatory flexibility analysis had been included, as well as an evaluation of the adherence of this plan with the M-S Act national standards.

Clarification of Status Determination Criteria

Status determination criteria (overfishing definitions) were previously adopted in Amendment 9. The proposed action will clarify and revise the status determination criteria (overfishing definitions). Criteria for most stocks will be based on fully-recruited fishing mortality and spawning stock biomass. In addition, minimum biomass thresholds are changed to comply with National Standards guidelines. The Amendment also adopts revised numerical estimates of these parameters. The Amendment also requires a review of all status determination criteria in 2008 so that management measures can be adjusted, as necessary, for the 2009 fishing year.

Proposed Rebuilding Periods

For stocks that require a formal rebuilding program, the Council is proposing to rebuild most stocks by 2014. There are exceptions to the proposed date that are explained in the text.

Proposed Rebuilding Programs

In response to comments received from the public, the Council will use a combination of an adpative and phased rebuilding trajectory strategy. The phased fishing mortality reduction strategy would not require as severe reductions in the initial years, but larger reductions in fishing mortality would be needed in later years. The adaptive strategy would fish at F_{MSY} through fishing year 2008, and then adjust mortality in order to rebuild most stocks by 2014. The proposed action combines these two strategies.

Fishery Program Administration

The measures proposed in this section address a wide range of administrative issues concerning groundfish management. Some of the measures also provide mechanisms to mitigate the impacts of the programs designed to rebuild groundfish stocks, such as through special access programs or refined requirements for certified bycath/exempted fisheries.

Periodic Adjustment Process

The proposed action would combine two existing management committees - the Multispecies Monitoring Committee (MSMC) and the Plan Development Team (PDT) - in order to streamline the management process. The amendment also identifies additional measures that can be adjusted through framework action. It also schedules assessments of groundfish stocks in 2005 and 2008 in order to monitor the rebuilding program and provide the information necessary to adjust management measures.

Biennial Adjustment

This action will decrease the frequency of scheduled framework adjustments to existing fishery regulations. Compared with the current annual adjustment, the proposed biennial adjustment (every two years) would provide more time for management measures to take effect and allow more time to evaluate the relevant scientific information on the status of the stocks and the effectiveness of the regulations. If necessary, the Council could choose to initiate an adjustment at other times.

US/Canada Resource Sharing Agreement

This action will incorporate the US/Canada Resource Sharing Agreement into the FMP. The informal agreement specifies an allocation of cod, haddock and yellowtail flounder on eastern Georges Bank for each country. Total catches by U.S. vessels from specific areas may not exceed the designated quota. U.S. vessels fishing in the trans-boundary area would be required to use an approved Vessel Monitoring System, and cannot fish both inside and outside the area on the same trip. There are a range of measures proposed to ensure the U.S. does not exceed its share.

Administration of Certified Bycatch/Exempted Fisheries:

The proposed action allows alterations to the current rules to provide increased flexibility to administer the exempted fisheries program. The Council considered but did not adopt a periodic review of the current exempted fisheries.

Special Access Program

Because management measures are generally applied over a wide geographic area and across many sectors of the fishing industry, access to healthy stocks is sometimes overly restricted. The proposed action implements a system to expedite regulations that allow access to multispecies stocks that are in good condition, or to target non-multispecies stocks that can be harvested without compromising the goals of this amendment.

Four specific special access program are proposed: a program to access GB yellowtail flounder in Closed Area II, a program to allow the landing of small incidental catches of winter flounder in the fluke fishery in Southern New England, a program to allow hook fishing for haddock in Closed Area I, and a program to facilitate catching the U.S. share of eastern GB cod, haddock, and GB yellowtail flounder under the U.S./CA resource sharing udnerstanding.

Closed Area Administration

The Council considered changes to the list of gear allowed access to closed areas. As part of measures to minimize to the extent practicable the adverse impacts of fishing on essential fish habitat, the Council proposes to prohibit hydraulic clamd dredges from groundfish closed areas.

Leasing Days-at-Sea

The proposed action wil implement a DAS leasing program for the fishery in order to enhance economic viability. Under this alternative, DAS can be leased, there is no conservation tax on leased DAS, DAS may be leased for a one-year period, leased DAS must be used during the period of the lease, leasing to more than one vessel is allowed, and only Category A DAS may be leased (see below for a description). Lease agreements must be registered with the NMFS. Additional provisions address administrative and conservation issues related to DAS leasing.

Observer coverage

The proposed action adopts a statement for a desired level of observer coverage.

Vessel Monitoring System Requirements
This measure allows vessels to sign-out of the multispecies fishery and stop VMS messaging for a period of at least 30 days, but they are not allowed to fish during that period.

Handgear Permit
The proposed action establishes one limited access permit category and one open access permit category. To be eligible for a limited access permit, a vessel must haveed 500 lbs. of cod, haddock, or pollock in any one fishing year from fishing years 1997 through 2001 when fishing under the handgear category. The trip limits for this new category would be 300 lb trip limit for cod. Open access permits are limited to 75 lbs. of cod.

Reporting Requirements
The Council proposes to adopt daily electronic dealer reporting. Dealer and vessel reports will be linked by a trip identitifier. Electronic vessel reporting may be required in the future.

Sector allocation
This alternative creates a system for approval of voluntary, co-operative sectors within the multispecies fishery. An organized sector would receive a share of the TAC or available DAS, based on prior history in the case of the TAC or current DAS allocations. The sector would form a plan that when approved by NMFS would control fishing by that sector. This may provide a way for sectors to adapt to the management regulations proposed.

One specific sector is proposed – the GB hook sector. This would implement implement a sector allocation for Georges Bank cod to the hook sector sector and allocates a portion of the Georges Bank cod total allowable catch. Other provisions include:

- Participation in the sector is voluntary
- A 'hard' TAC would be allocated to the sector based upon the share of the Georges Bank cod caught by the hook sector members during fishing years 1996 through 2001.
- Vessels in the sector would be required to have a vessel monitoring system and jig and longline vessels would be subject to seasonal trip limits.
- All vessels in the sector would be required to have a vessel monitoring system and there would be mesh restrictions and net limits according to whether a vessel is a Day or Trip vessel and uses stand-up or tie-down nets.

Alternatives to Control Fishing Capacity

Since the implementation of the DAS program under Amendment 5, a large portion of the total number of allocated DAS have not been used. Such unused DAS (also known as 'latent effort') represent potential future fishing effort. Without some type of control on this latent effort, the use of DAS could increase and thus make it more difficult to rebuild stocks. The following actions were designed to reduce unused DAS and provide additional flexibility to the industry by allowing, for example, transfer of DAS.

Days-at-Sea Transfer
This proposal will allow multispecies limited access permit holders to permanently transfer DAS to other multispecies limited access permit holders, with some restrictions. The selling vessel is required to retire from all Federal and state fisheries (limited access and open access). The current restrictions on the allowable maximum size of a replacement vessel would continue to apply (buying vessel cannot be greater than 10% larger in size or tonnage, or have a horsepower greater than 20% of the selling vessel).

Days-at-Sea Reserve

This alternative is built on the concept that a vessel's DAS can be divided into two classes, those that have been used and those that have not been used. Because DAS represent fishing effort, those DAS that have been used are referred to as "effective effort". This alternative first would calculate the amount of used DAS (effective effort) each vessel has had historically. Effective effort is calculated on the basis of DAS use and groundfish landings during the period fishing year 1996 through 2001.

Once effective effort is calculated, DAS would be divided into three categories: Category A: effective DAS available for use; Category B: effective DAS that can only be used to target healthy stocks either through special access programs or other programs developed in a future management action; and Category C: latent (unused) DAS, which is the difference between a vessel's Amendment 7 allocation of DAS, and its number of effective DAS. Upon implementation of Amendment 13, Category A DAS are available to fish for any groundfish species. Category B DAS may be used to fish in special access programs. Future frameworks will consider additional uses for Category B DAS. In the future, the ratio of Category A to Category B DAS may be adjusted, and Category C DAS may be allowed back into the fis hery subject to a conservation tax.

Measures to Address Rebuilding Requirements

Commercial Fishery Measures

- Category A DAS, that can be fished on on stock, are limited to sixty percent of effective effort as defined by the DAS reserve program. Category B DAS are sub-divided into Category B (regular) and Category B (reserve) DAS. Upon implementation of the amendment, Category B DAS can be used to target healthy stocks through special access programs. Future management actions may create additional opportunities to target healthy stocks using Category B (regular) DAS outside of special access programs.
- The Gulf of Maine cod trip limit is increased to 800 lbs-day/4,000 lbs. per trip
- Rolling closures, year-round closures, and min imum fish sizes, implemented August 1, 2002 are continued.
- The Georges Bank cod trip limit is reduced to 1,000 lbs-day/10,000 lbs-trip for trawl and gillnet vessels. A seasonal trip limit is in place for hook gear.
- Cape Cod/Gulf of Maine yellowtail flounder is subject to a seasonal trip limit: 250 lbs (May/June) and 750 llbs-day/3,000 lbs-trip (October/November)
- Southern New England/Mid-Atlantic yellowtail flounder is subject to a to a seasonal trip limit of 250 lbs (March through June) and 750 lbs-day/3,000 lbs-trip (July through February)
- Several gear modifications are adopted, including increased mesh size (compared to that used in fishing year 2001) and additional restrictions on gillnets. These changes are similar to the measures adopted under the Framework 33 settlement agreement.
- In order to implement the phased and adaptive strategies, in fishing year 2006 through 2008, Category A DAS will be limited to fifty-five percent of effective effort as defined by the DAS reserve program. In fishing year 2009, Category A DAS will be limited to forty-five percent of effective effort as defined by the DAS reserve program. These default measures may be adjusted based on stock conditions.
- Beginning in fishing year 2006, vessels fishing in the Southern New England or Mid-Atlantic Regulated Mesh Areas from December through April would be charged DAS at a rate of 1.5 days for each day fished. This default measure may be adjusted based on stock conditions.

Recreational Fishery Measures

The proposed action implement a 10 cod per person per day limit for the private recreational vessel and a 10 cod per person per day limit for the charter/party vessel fishing in the Gulf of Maine. Any trip greater than 15 hours in length and covering 2 calendar days would be considered more than one day. The minimum recreational cod size would be 22 inches, and minimum recreational haddock size would be 19 inches.

Description of Alternatives to Minimize the Adverse Effects of Fishing on Habitat (to the extent practicable)

A broad range of alternatives have been considered to minimize, to the extent practicable, the adverse effects of fishing on habitat. These meaures were previously analyzed and distributed for public comment as the *Draft Environmental Impact Statement for the Essential Fish Habitat Components of Amendment 13 to the Northeast Multipsecies Fishery Management Plan.* Of the broad range of alternatives, the Council selsected three (3) to satisfy their statutory mandate.

<u>Alternative 2: Benefits to EFH of other Amendment 13 measures</u>
Because management measures that were designed to reduce fishing mortality may also provide benefits to fish habitat, such management measures should be explicitly considered as part of a formal strategy to reduce impacts on habitat.

<u>Additions or modifications to closed areas (Alterantive 10 (option b): CompromiseHabitat Closure Areas</u>
Closed areas that are modifications of existing mortality closures and other proposed closed habitat closures

<u>Expand list of prohibited gears in closed areas (Alternative 7)</u>
This proposal will expand the of types of fishing gears prohibited in closed areas to include clam dredges.

Other Issues

<u>Northern Shrimp Fishery Exemption Area</u>
This action removes the multispecies plan restriction on the area available to the Northern Shrimp Fishery.

<u>Tuna Purse Seine Access to Closed Areas</u>
This action will allow tuna purse seine vessels access to all groundfish closed areas.

<u>Southern New England General Category Scallop Exemption Program</u>
Subject to any restrictions in the scallop FMP, this action will allow access to an exemption area in southern New England to fish for scallops for vessesl allowed to fish as general category scallop vessels. Vessels would be allowed to fish in this area while not under a multispecies day-at-sea as long as they comply with several restrictions.

Biological Impacts of Alternatives

<u>Fishery Program Administration</u>
The following measures are not expect to have any impact on fishing mortality: changing the periodic adjustment process, modifying the administration of the certified bycatch/exempted fisheries, eliminating the Flexible Area Action System (FAAS), observer coverage requirements, VMS requirements, reporting requirements, sector allocation mechanism, including creation of two specific sectors. Special Access Programs are not expected to increase fishing mortality on stocks of concern, but may increase mortality on healthy stocks.

<u>Rebuilding Strategies</u>
The proposed action will rebuild most overfished stocks by 2014. The three exceptions are CC/GOM yellowtail flounder (2023), GB cod (2026), and redfish (2051).

<u>Measures to Address Rebuilding Requirements</u>
The proposed commercial and recreational fishing measures are expected to reduce fishing mortality to rates necessary to achieve rebuilding and end overfishing. The inclusion of Category B DAS is not expected to adversely impact the rebuilding strategy on managed species. The use of these DAS will be limited to programs designed to have minimal impact on stocks for which fishing mortality must be

reduced. The impacts of eliminating the area restriction for the Northern Shrimp Fishery is difficult to estimate, but is expected to be minimal. Providing unrestricted access for tuna purse seine vessels to closed areas may increase bycatch of groundfish in those areas, but the increase is likely to be small, and the SNE General Category Scallop Exemption Area should have little effect on rebuilding of groundfish stocks in this area.

Habitat Impacts of Commercial Rebuilding Alternatives and Recreational Measures
All the rebuilding alternatives increase the level of habitat protection compared to No Action, but the proposed rebuilding alternative and Alternatives 1 and 2 would have greater habitat benefits due to the increased level of effort (DAS) reduction and the gear restrictions that they include. Reductions in fishing effort, including DAS reductions, are one mechanism known to minimize the adverse impacts on habitat associated with fishing, by reducing the frequency and intensity of fishing gear use. The benefits of closures to habitat are dependent upon the types of habitat within the closed area, the length of the closure, and the types of gear permitted inside them. Recreational fishing, primarily through hook and line, has no significant impact on habitat.

Measures to Minimize the Adverse Affects of Fishing on Habitat
This document includes a detailed gear effects evaluation, determination of adverse effects, and practicability analysis for all habitat alternatives. The potential impacts of the various year-round closed area scenarios have been evaluated from a habitat perspective by analyzing sediment composition, the biomass of selected groups of species within each closed area alternative, and the amount of area designated as EFH for 23 species with benthic life stages that were determined to have EFH that is vulnerable to the effects of mobile, bottom-tending gear. Another factor that was considered was the size of each proposed closed area and the extent to which each one overlaps with portions of the existing groundfish closed areas that have either remained closed to groundfish gear and scallop dredges since these closures were established in 1995 and 1998, versus portions that were opened temporarily to scallop dredging in 1999 and 2000.

Measures to Control Capacity and Increase Flexibility
The proposed action will reduce the possibility of latent effort re-entering the fishery in an uncontrolled manner.

Impacts on Protected Species
Conservation and management measures in Amendment 13 minimize bycatch and bycatch mortality of unavoidable discards to the extent practicable. Amendment 13 is likely to decrease effort among all gear components of the fishery. For this reason, the Amendment will not increase sink gillnet effort in the region and will not affect the ability of the Harbor Porpoise Take Reduction Plan to maintain serious injuries and mortalities below allowable levels. The existing FMP measures in combination with other measures adopted to protect these species will affect, but are not likely to jeopardize the continued existence of large whales, turtles, or other protected species.

Impacts of Alternatives on Bycatch
Many of the measures included in the proposed action will have a direct impact on bycatch and/or bycatch mortality, although it is difficult to quantitatively evaluate these impacts. The adopted rebuilding strategy will require significant reductions in catch in the initial years of the program. Coupled with strict controls on fishing effort, the proposed action should reduce overall bycatch levels of groundfish, skates, monkfish, and dogfish.

The proposed action contain DAS reductions that are likely to significantly reduce discards and discard mortality of all bycatch species by reducing time fishing and by reducing total catch. Some measures, such as increased mesh and higher trip limits for some stocks, may also reduce the rate of discards. Although reduced trip limits may increase bycatch if fishermen are unable to avoid catching the limited species, an increasing daily trip limit reduces the discard to kept ratio. The proposed Georges Bank access program for yellowtail flounder is likely to result in the discarding of several species, including non-groundfish species, however discard rates appear to be minimal based on available data. The proposed US/CA Resource Sharing Understanding Special Access Program may also increase discards, but the adoptiong of a hard TAC for cod, haddock, and yellowtail flounder will control any increases. The SNE/MA Winter Flounder Incidental Catch Special Access Program may reduce discards since vessels will be allowed to land small amounts of winter flounder that now must be discarded to comply with the regulations.

Economic Impacts of Alternatives

The economic effects of the proposed action are evaluated from both a short term and long term perspective.

Rebuilding Periods

Rebuilding most stocks by 2014 will result in an additional discounted economic benefits compared to rebuilding most stocks by 2009.

Rebuilding Strategies

The economic benefits of rebuilding strategies were compared assuming perfect implementation – that is, all target fishing mortality rates are achieved. The rebuilding strategy associated with the Proposed Action, however, is based in part on the fishing mortality rates that are expected toresult from the proposed management measures. The economic impacts of the pproposed measures thus are more likely to reflect future realized economic impacts. The purpose of the analysis, however, is primarily to compare strategies and not to predict specific revenue or net benefit levels.

In general, the net benefit of a rebuilding program, regardless of strategy chosen, would be greater than the net benefit of taking no action, but this is dependent on the time period for evaluation. The proposed action will yield positive economic benefits by 2019, while the adaptive strategy (not selected) would yield positive economic benefits by 2018, the constant fishing mortality strategy (not selected) by 2018, and the phased reduction strategy (not selected) by 2021. Because projected landings streams are subject to uncertainty, it is useful to examine the probability that rebuilding benefits will exceed the no action alternative. There is only a five percent changes that positive benefits will accrue under the proposed action by 2014, while there is at least an 80 percent probability that any of the rebuilding strategies will return positive benefits by 2026. The adaptive fishing mortality rebuilding strategy provides the highest present value, but is only slightly greater than the constant fishing mortality strategy. The difference in present value between the No Action Alternative and rebuilding (any strategy) is less than $300 million over 23 years.

Mean total landings for the regulated groundfish species, projected to be about 127 million lbs in 2003, were projected to be 289 million lb. in 2026 (when all stocks are rebuilt) for the "No Action" alternative. This compares to landings of 146 million pounds under the proposed action in 2004, and 320 million pounds by 2026. Nominal revenues under no action are expect to increase to $344 million in 2026, but will increase to $360 million under the proposed action. Net benefits would increase to $280 million under no action, but will increase to $310 million under the proposed action. The projected revenue streams suggest that over the long term much of the economic losses predicted will be offset by gains in harvest levels. The proposed action yields higher groundfish landings than any of the other rebuilding strategies considered for the period 2004 through 2007, and the second highest landings in 2008. From 2009 through 2014, the proposed action yields lower landings than other rebuilding strategies.

Measures to Address Rebuilding Requirements

While the comparison of rebuilding strategies assumes all target fishing mortality rates are achieved, the evaluation of the distributive impacts of the proposed action uses a model that estimates the actual exploitation rates that could result from the major elements of the alternatives. These impacts are short-term in nature. These revenue impacts are reported for different categories of groundfish vessels. In general, the analysis shows that those vessels or communities that are most dependent on groundfish will be most affected by the proposed action. Twenty-five percent of the vessels that claim Maine, New Hampshire, or Massachusetts as a homeport will lose at least one-third of gross revenues. The ports of Boston, Chatham/Harwichport, New Bedford, Portland, and Upper Mid-Coast Maine will be most affected. Median revenue losses for gillnet and hook gear are expected to be lower than for trawl gear. For those vessels that rely on groundfish for seventy-five percent or more of their fishing revenue, the median revenue loss is thirty-five percent. These impacts do not include any revenues that may be earned while fishing on Category B DAS or in special access programs.

An input/output model was constructed to evaluate the imapcts of rebuilding alternatives on coastal economies. This is also a short-term analysis that does not estimate the impacts of increased future landings as a result of stock rebuilding. The total combined impact on the New England economy, in terms of sales, is estimated to be a loss of $135.5 million. About nineteen hundred jobs will be affected, primarily in the fishing industry, while the proposed action will reduce personal incomes by $55.4 million.

With regard to the recreational measures, the economic impacts are small, relative to the beneficial biological impacts of those measures.

Measures to Minimize the Adverse Affects of Fishing on Habitat

The practicability analysis synthesizes all the conclusions from the habitat alternative analysis, including the socio-economic impacts, biological and ecological impacts, other identified impacts, as well as issues such as compliance with National Standards. Economic impacts of additional habitat closed areas were analyzed by examining recent revenues from those areas different species or species groups. The amount of revenues that would have been displaced if no fishing gear was allowed in those areas was calculated. Generally the more area closed, the more revenues are displaced. Much of the revenues displaced under all habitat closure alternatives is a result of a decrease in lobster landings. The level of habitat closure – that is, what gear is excluded from an area – affects the ranking of the habitat closure alternatives. Habitat closure alternative 5a has the most revenue impacts if all gear is excluded, but Alternative 5b has the most impact if only mobile gear is excluded.

Impacts of habitat alternatives on coastal economies were also estimated. These impacts cannot be added to those expected to result from the rebuilding alternatives, as different methods are used.

Measures to Control Capacity

Each of the capacity proposals is designed to provide greater economic opportunity and flexibility in all fisheries while maintaining the character of the existing fleet, and to achieve some long-term reduction in the number of vessels permitted to fish in the Northeast fisheries. The DAS transfer alternative requires that with the transfer of its DAS, a selling vessel must retire from fishing in state or Federal open and limited access fisheries. While this expands economic opportunities for some vessels, it eliminates participation of others in the groundfish and other fisheries. This may reduce voluntary participation in the capacity reduction programs. The measure which defines effective effort may have widely varied impacts on permit holders depending on their history in the groundfish fishery, benefiting some and severely limiting others.

Social and Community Impacts of Alternatives

Social impacts of DAS reductions tend to be more far-reaching and long-term in nature than social impacts from other management measures like trip limits, gear restrictions, and seasonal area closures. DAS reductions tend to significantly disrupt daily living, limit occupational opportunities, and alter community infrastructure. The majority of vessels that have multispecies Limited Access Individual DAS permits, use more of their allocated DAS, and will be most impacted by the large reductions in DAS proposed are homeported in Portland, Boston, and New Bedford. Trip limits are most likely to affect regulatory discarding and attitudes towards management. If Georges Bank trip limits are set too low, disproportionate impacts are likely to be experienced by the hook sector in Chatham/Harwichport, but the approval of the hok sector may mitigate these impacts to some extent. The nature of impacts of the gear restrictions under consideration will depend on the cost of the new gear, the current availability of the new gear, and vessel's choices as to whether or not to fish in the areas where the new gear is required. Set-asides for bycatch fisheries will reduce negative social impacts. Sector allocation and area management could provide for development of management measures that are more consistent with fishing activity and resource conditions in a particular area, encourage a greater sense of stewardship, and ensure that fishing activity in one sector does not adversely affect fishing activity in another sector.

Cumulative Impacts

Long-term effects of each of these rebuilding alternatives on the multispecies stocks are clear: stocks will rebuild as a result of the accumulated effects of measures applied over time and in response to these specific measures in Amendment 13 targeted at stock rebuilding. Effects of these alternatives in the long term are less clear or quantifiable from a social and economic perspective.

Fishery program administration measures will have generally small or negligible cumulative effects on fishing communities, groundfish stocks and habitat. The capacity reduction measures, which are designed to provide increased flexibility and economic opportunity, may have positive cumulative effects on fishery participants while reducing effort over the long term. In the short term, however, they will limit the opportunity of some permit holders to participate in the fishery. Alternatives to reduce the impacts of fishing on habitat will have limited positive cumulative effects on fishery resources. Cumulative effects of these alternatives on EFH may be positive, and will vary among alternatives. Measures to achieve stock rebuilding will all have strong positive effects on the resource through large reductions in fishing effort. These alternatives will have negative cumulative effects on fishing communities, particularly over the short term, but are intended to ensure that a sustainable fishery is attained in the long term. Some effects of these measures on fishing communities may be irreversible, such as losses in shoreside infrastructure and gentrification of the waterfront in response to reductions in the fishing fleet. As a result, the benefits that will utimately accrue from the rebuilding program may not be realized by current participants in the fishery. The proposed action attempts to mitigate these impacts by allowing higher landings in the 2004 – 2008 period than other alternatives, which should help some fishermen remain in business as stocks rebuild. In general, measures which reduce fishing effort will have a negative cumulative effect on fishery participants while producing a positive effect on the resource and habitat.

Fishery Program Administration Measures

Alternative Name	Description
Periodic Adjustment Process	
Modified Periodic Adjustment Process	revision of PDT to include MSMC SAFE report prepared each year but adjustment process occurs biennially (every 2 years) addition of new frameworkable items
US/CA Resource Sharing Understanding	specifies an allocation of GB cod, haddock and yellowtail flounder for ea. country (allocation based on a formula which includes distribution of the historical catch between the nations and present resource distribution) if a species allocation is reached during course of FY in U.S., TAC for following year is reduced by the same amount
Administration of Certified Bycatch/Exempted Fisheries	as in A-7, incidental catch of regulated multispecies must be less than 5% of total catch by weight (this standard may be changed through Council action) other impacts of fishery must be considered during review bycatch/exempted fishery may be authorized on case-by-case basis to retain and land regulated multispecies
Special Access Programs (SAP)	provides access to limited, specific regulated multispecies fisheries or other non-groundfish fisheries that do not undermine objectives of the multispecies FMP but would otherwise be prohibited requires submission and approval of a management action by the Council demonstrating that SAP will not adversely impact stocks of concern, analyzing impacts of the proposal and demonstrating compliance with applicable law requires submission, review and approval by Council and/or Regional Administrator
Specific SAPs	
Georges Bank Yellowtail Flounder Special Access Program	June-December—fishing vessels may make 2 trips/month into area opened for scallop CAII access program for yellowtail flounder vessels limited to 30,000 lbs yellowtail per trip all vessels required to use VMS no DAS charged for transit to CAII/statistical areas 561 and 562 may not fish until after entering open area and starting DAS clock DAS clock stops exiting area vessels limited to 1/5 of daily GB cod trip limit Maximum of 320 trips, but RA may change # of authorized trips
Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program	a vessel fishing for fluke west of 72-30' W using mesh authorized by fluke plan and not on a groundfish DAS may retain and land up to 200 lbs. of winter flounder vessel must possess valid fluke permit vessel must have fluke on board vessel operator must sign into program for minimum of 30 days and have LOA from RA on board cannot fish on a groundfish DAS when in the program fishing must take place west of 72-30'W possession and/or landing of other groundfish is prohibited
U.S./CAN Resource Sharing Understanding SAP	vessels fishing in 5Zjm given DAS credit for steaming time: time spent steaming to **and** from area will not be charged access provided to CAII to facilitate catching haddock and yellowtail for period of 10 mos. (not March and April) (may be adjusted by RA) measures may be adjusted by RA other incentives possibel in future
CA I Hook Gear SAP	Allows limited hook fishign to target haddock in CA I Observer coverage on all trips

Closed Area Administration	
Rationale for Closed Areas	When closures are adopted, Council will define intent and specific purpose of closures and explicitly describe duration of closure and who can/cannot fish there
Flexible Area Action System (FAAS)	the FAAS will be eliminated
Leasing of DAS	DAS may be leased from one fishing vessel to another, subject to a number of restrictions
Conservation Equivalency Alternatives	lessor may not lease DAS to any vessel with a horsepower that is over 20% more than that of the lessee or a LOA, GRT and NT that is over 10% more than that of the lessee DAS cannot be sub-leased
Limitations on Number of DAS Leased	a vessel may lease the number of DAS equal to its allocation for FY2001 (not including carry-over DAS)
Permit History Provisions	history of DAS use remains with permit that "owns" the DAS landings associated with leased DAS remain with the permit that lands fish if a vessel does not use all allocated and leased DAS, DAS will be considered used first
Expiration of Leasing Program	leasing automatically expires after 2 years unless extended by Council action
Observer Coverage	10% observer coverage requested; NMFS will determine by 2006 w hether this level is appropriate
VMS Requirements	vessel using VMS can withdraw from program for min. of one calendar month and can not during this period or transit in the EEZ with gear capable of catching groundfish unless it is properly stowed
Reporting Requirements	
Dealer Reporting Options	
Daily electronic reporting	Daily electronic dealer reporting where the dealer reports a trip identifier and type of catch; Reports due to NMFS within 24 hours of the transaction Trip identifier generated and reported by the vessel or the dealer(s)
Vessel Reporting Options	
Trip Identifier	Current VTR requirement maintained for all vessels with the addition of the trip identifier and possibel future adoption of electronic vessel reporting
Hand-Gear Only Permit Alternatives	
Category A – Limited Access	vessel in the open access handline/rod and reel category must have landed 500 lbs. of cod, haddock or pollock in at least one FY from 1997-2001 permits may be transferred trip limit is 300 lbs. cod for all other species trip limits same as for limited access vessels cod trip limit adjusted proportionally to that for DAS vessels same yr-round and seasonal closures as for limited access vessels
Category B – Open Access	trip limit is 75 lbs. cod for all other species trip limits same as for limited access vessels cod trip limit adjusted proportionally to that for DAS vessels
Sector Allocation (general)	
Formation of a Sector	participation voluntary (non-participants in common pool) must submit legally binding plan of operations
Sector Review and Approval	
Periodic Adjustment Process	sector will submit operations plan to Council at least one year before planning to start operations Council will implement plan during course of periodic adjustment process
Movement Between Sectors	
Option 3	allow for each sector to set their own rules on movement

Allocation of Resources	allocated based on documented catch allocated TACs for entire sector based on accumulated catch histories over previous five years of participants specific years defined for determining catch history
Mortality/Conservation Controls	hard annual TACs by species allocated to the sector as a whole
Enforcement of Sector Provisions/VMS Requirements	responsibility of each sector to enforce provisions adopted through plan no VMS requirements unless adopted in A-13
Interaction of Sector with Common Pool Vessels	a sector will not pay consequences if TACs exceeded by other sectors or common pool vessels if a sector exceeds TAC, quota will be reduced by same amt. as overage in following year sectors may be subject to same closed areas, min. fish sizes, permitting restrictions, gear restrictions, and reporting requirements as common pool vessels
Georges Bank Hook Sector Allocation	sector created: hook sector for harvesting Georges Bank cod participation voluntary allocation depends on history of participating permit holders
Georges Bank Cod Hook Sector	hard TAC for GB cod allocated to sector (quota determined by calculating share of GB cod harvest by sector participnts with hook gear 1996-2001) when TAC reached, fishing ceases for commercial hook sector longline vessels limited to max. of 3,600 12/0 circle hooks per trip measures to be defined in operations plan

Capacity Reduction Alternatives

Alternative Name	Reduction in DAS?	Affected Groups, general	Additional Restrictions	Details
DAS Transfer	yes 40% active; 90% inactive	multispecies limited access permit holders	LOA or tonnage of buying vessel not more than 10% greater than LOA or tonnage of selling vessel hp of buying vessel not more than 20% greater than hp of selling vessel seller retires from fishing	DAS may be used in entirety any time following transaction (subjec to any limits based on category of DAS)
DAS Reserve	no	multispecies permit holders	Category A DAS may be used to target any groundfish species when A-13 implemented Category B DAS can be used in special access programs, and as defined in future Category C days frozen in reserve account	Based on DAS use FY 1996 through 2001, in years when 5,000 pounds of groundfish landed Three categories of DAS defined (A, B, C)

Management Alternatives to Address Rebuilding Requirements

Alternative Name	Area Closures (yr-round)	Seasonal/Rolling Closures	Possession Limits	Effort Controls	Gear Restrictions	Minimum Fish Sizes	VMS Requirements	Additional Restrictions	Details
Proposed Action	current closures maintained (CA I & II, NLS, CL, WGOM)	**Gulf of Maine** March 121, 122, 123 April 121-125, 129-133 May 124-125, 129-133, 136-140 June 132-133, 139-140, 141-147, 152 October 124, 125 November 124, 125 **Georges Bank** May 80-81, 98-99, 109-114, 118-120 south of 42°20'N	GOM cod- 800 lb/day, 4,000 lb/trip GB cod- 1,000 lb/day, 10,000 lb/trip or seasonal limt for hooks, CC/GOM yellowtail- Apr-1-May 31, Oct 1-Nov 30 250 lb. possession lim.; Rest of year 750 lbs/DAS, 3,000 lbs/trip possession lim. SNE/MA yellowtail- March 1-Jun 30 250 lb. possession lim.; Jun 1-Feb 28 750 lbs/DAS, 3,000 lbs/trip possession lim. RA may adjust haddock trip limit prior to or during FY to prevent exceeding target TAC or allow harvesting up to 75% of target TAC	Based on DAS reserve Baseline FY 2004-2005 Cat A: 60% Cat B (reg): 20% Cat B (res): 20% FY 2006 - 2009 Cat A: 55% Cat B (reg): 25% Cat B (res): 20% In SNE/RMA mesh area, DAS count 1.5:1 FY 2009 Cat A: 45% Cat B (reg): 35% Cat B (res): 20% Cat B DAS can only be used in a Special Access Program until requirements for use of Cat B (reg) DAS specified in a future framework	**Day Gillnet**- • GOM: 6.5" roundfish, 50 net max.; 6.5" flatfish, 100 net max. • GB: 6.5" all nets, 50 net max. • SNE: 6.5" all nets, 75 net max. • MA: 6.5" roundfish, 75 net max.; 6.5" flatfish, 75 net max. **Trip Gillnet**- • GOM: 6.5" all nets, 150 net max. • GB: 6.5" all nets, 150 net max. • SNE: 6.5" all nets, 75 net max. • MA: 6.5" all nets, 75 net max. Monkfish- • 10", 150 net max. **Trawl**- • GOM/GB: 6.5" diamond/sq. cod end, raised footrope trawl (two options on area), 8.5" diamond/sq. large mesh entire net • SNE: 7" diamond/6.5" sq. cod end, 8.5" diamond/sq. large mesh entire net • MA: 6.5" diamond/sq. cod end, 7.5" diamond/8" sq. large mesh entire net **Hook gear** - • GOM: 2000 hooks • GB: 3600 hooks • SNE: 2000 hooks • MA: 4500 hooks • at least 6" between fairlead rollers, all areas; min. size 12/0 circle hooks for longline (except in MA)	Cod 22" Haddock 19" Pollock 19" Witch flounder 14" Yellowtail flounder 13" Atlantic halibut 36" American plaice 14" Winter flounder 12" Redfish 9"	none	management measures adopted by the negotiated settlement agreement (August 1, 2002) are maintained unless sepcifically changed	

Recreational Fishing Measures				
Alternative Name	**Minimum Fish Sizes**	**Possession Limits**	**Closed Seasons**	**Other**
Proposed Action	Cod - 22" haddock- 19"	**Private**- 10 cod/person/day no haddock limit **Party/Charter**- 10 cod/person/day no haddock limit any trip in excess of 15 hrs **and** covering 2 consecutive calendar days is considered >1 day	none	all other measures in place during FY2001 will continue to apply

Alternatives to Minimize the Adverse Effects of Fishing on Habitat			
Alternative Name	**Gear Restrictions**	**Area Closures (see note below on Closure Levels*)**	**Additional Restrictions and Details**
Alternative 2 – Complementary benefits of other Amendment 13 Alternatives	see Details	see Details	measures chosen in Amendment 13 will be relied on to provide habitat protection
Alternative 7 - Expand list of gears prohibited in closed areas	list of fishing gear prohibited from use in habitat closed areas expanded to include clam dredges	no additional closures	none
Alternative 10 - Habitat Closed Areas that are modifications of existing mortality closures and other proposed habitat closures	none	• habitat designated closed areas within existing yr-round closures • extension on NLCA new closures • Modified mortality closed areas and other proposed habitat closures including the *original* Cod HAPC in Closed Area II	Level 3 – The area will be closed indefinitely on a year-round basis to all bottom tending mobile gear.

Other Issues		
Alternative	Description	Other Requirements/Restrictions
Northern Shrimp Fishery Exemption Area	No multispecies FMP restrictions on the area authorized for the Northern Shrimp Fishery	Nordmore grate requirement maintained
Tuna Purse Seine Vessel Access to Groundfish Closed Areas	Tuna purse seine vessels allowed into all groundfish closed areas	Fishing for, landing or retaining multispecies (including small-mesh multispecies) prohibited May not have on board gear capable of catching groundfish Vessels may not fish in CA II HAPC RA can alter access if necessary to protect habitat or groundfish stocks
SNE General Category Scallop Vessel Exemption Program	Exemption program created	Subject to restrictions in the Scallop FMP May not fish for, possess on board, or land any species other than scallops Combined dredge width on board shall not exceed 10.5 feet Eight inch minimum twine top Does not apply to NLCA unless specifically authorized through multispecies FMP

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ALWTRP	Atlantic Large Whale Take Reduction Plan
APA	Administrative Procedures Act
ASMFC	Atlantic States Marine Fisheries Commission
CAI	Closed Area I
CAII	Closed Area II
CC	Cape Cod
CPUE	catch per unit of effort
DAM	Dynamic Area Management
DAS	days-at-sea
DFO	Department of Fisheries and Oceans (Canada)
DMF	Division of Marine Fisheries (Massachusetts)
DMR	Department of Marine Resources (Maine)
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EEZ	exclusive economic zone
EFH	essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAAS	Flexible Area Action System
FMP	fishery management plan
FSCS	Fisheries Scientific Computer System
FW	framework
FY	fishing year
GAMS	General Algebraic Modeling System
GB	Georges Bank
GIS	Geographic Information System
GOM	Gulf of Maine
GRT	gross registered tons/tonnage
HAPC	habitat area of particular concern
HPTRP	Harbor Porpoise Take Reduction Plan
I/O	input/output
IFQ	individual fishing quota
ITQ	individual transferable quota
IVR	interactive voice response reporting system
IWC	International Whaling Commission
LOA	letter of authorization
LPUE	landings per unit of effort
MA	Mid-Atlantic
MAFAC	Marine Fisheries Advisory Committee
MAFMC	Mid-Atlantic Fishery Management Council
MARFIN	Marine Fisheries Initiative
MEY	maximum economic yield
MMC	Multispecies Monitoring Committee
MMPA	Marine Mammal Protection Act
MPA	marine protected area
MRFSS	Marine Recreational Fishery Statistics Survey
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSMC	Multispecies Monitoring Committee
MSY	maximum sustainable yield

NAA	No Action Alternative
NAPA	National Academy of Public Administration
NAS	National Academy of Sciences
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office
NFMA	Northern Fishery Management Area
NLCA	Nantucket Lightship closed area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NSTC	Northern Shrimp Technical Committee
NT	net tonnage
NWA	Northwest Atlantic
OLE	Office for Law Enforcement
OY	optimum yield
PBR	Potential Biological Removal
PRA	Paperwork Reduction Act
PREE	Preliminary Regulatory Economic Evaluation
RFA	Regulatory Flexibility Act
RMA	Regulated Mesh Area
RPA	Reasonable and Prudent Alternatives
SAFE	Stock Assessment and Fishery Evaluation
SAP	Special Access Program
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop
SBNMS	Stellwagen Bank National Marine Sanctuary
SEIS	Supplemental Environmental Impact Statement
SFA	Sustainable Fisheries Act
SFMA	Southern Fishery Management Area
SIA	Social Impact Assessment
SNE	southern New England
SNE/MA	southern New England-Mid-Atlantic
SSB	spawning stock biomass
SSC	Social Science Committee
TAC	total allowable catch
TED	turtle excluder device
TMS	ten minute square
TRAC	Transboundary Resources Assessment Committee
TSB	total stock biomass
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system
VPA	virtual population analysis
VTR	vessel trip report
WGOM	Western Gulf of Maine
WO	weighout
YPR	yield per recruit

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1.0 Introduction

This Amendment 13 to the Northeast Multispecies Fishery Management Plan (FMP) proposes changes to the management program for this fishery. It is prepared by the New England Fishery Management Council (NEFMC, Council) in partnership with the National Marine Fisheries Service (NMFS). It is developed in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA, M-S Act), the primary domestic legislation governing fishery management of the nation's marine fisheries and resources. In 1996, Congress passed the Sustainable Fisheries Act (SFA), which amended and re-authorized the M-S Act and introduced new emphasis on rebuilding overfished fisheries, ending overfishing, minimizing bycatch and bycatch mortality, and minimizing to the extent practicable the adverse impacts of fishing activity on essential fish habitat (EFH).

Although this FMP has been prepared primarily in response to the requirements of the M-S Act, it also addresses the requirements of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). However, these are not the only laws and administrative orders that the Council must consider in developing an FMP. In preparing a Fishery Management Plan, the Council must comply with the requirements of the National Environmental Policy Act (NEPA), and Regulatory Flexibility Act (RFA), the Administrative Procedures Act (APA), the Paperwork Reduction Act (PRA), the Coastal Zone Management Act (CZMA), the Data Quality Act (P.L. 106-554), and Executive Orders 12612 (Federalism), 12630 (Property Rights), 12866 (Regulatory Planning), 12898 (Environmental Justice), and 13158 (Marine Protected Areas). These other applicable laws and administrative orders help ensure that in developing an FMP, the Council considers the full range of alternatives and their expected impacts on the marine environment, living marine resources, and the affected human environment. This integrated Supplemental Environmental Impact Statement (SEIS), which is required by NEPA, addresses these requirements.

This document is organized into four volumes:

Volume I:	Introductory material Proposed action and other alternatives considered Impacts of the proposed action and other alternatives considered
Volume II:	Affected environment
Volume III:	Appendices
Volume IV:	Public comments

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2.0 Background and Purpose

2.1 Brief History of Prior Management Actions

The Northeast Multispecies FMP was adopted in 1986 to manage key groundfish stocks from Maine to Cape Hatteras. Management actions under this FMP were summarized in Amendment 5, adopted in 1994. The key actions leading to this action since Amendment 5 are summarized below.

Sustainable Fisheries Act

Despite the efforts taken in Amendment 5 and the cutbacks made by the industry during the following years, new legislation in 1996 set the standards for effective management even higher. The Magnuson-Stevens Act was amended with the adoption of the Sustainable Fisheries Act (SFA) in 1996. The SFA placed new demands on fishery management plans to reduce bycatch, identify and protect Essential Fish Habitat, and minimize adverse effects of fishing on EFH to the extent practicable. It also initiated new National Standards in the MSFCMA that emphasized minimizing impacts to fishing communities, improving safety at sea, significantly reducing bycatch and improving the collection and use of fishery and biological data.

Amendment 7

Amendment 7, implemented in 1996, sought to address the requirements of the SFA and newly amended MSFCMA. The amendment accelerated the DAS effort reduction program established in Amendment 5, eliminated significant exemptions from the current effort control program, provided incentives to fish exclusively with mesh larger than the minimum required, broadened the area closures to protect juvenile and spawning fish, and increased the haddock possession limit to 1,000 pounds. It established a rebuilding program for Georges Bank (GB) and Southern New England (SNE) yellowtail flounder, GB and GOM cod, and GB haddock based primarily on days-at-sea (DAS) controls, area closures, and minimum mesh size. Additionally, the amendment changed existing permit categories and initiated several new ones, including an open access multispecies permit for limited access sea scallop vessels. Amendment 7 also created a program for reviewing the management measures annually and making changes to the regulations through the framework adjustment process to insure that plan goals would be met. Of all the major changes to the Northeast Multispecies Plan, Amendments 5 and 7 had the greatest impact on the fishery, both for stock rebuilding and in shaping the socio-economic conditions of the industry and fishing communities.

Amendment 9 and Essential Fish Habitat

Amendment 9 (1999) also had a significant impact on the fishery, establishing new status determination criteria (overfishing definitions) and setting the Optimum Yield (OY) for twelve groundfish species to bring the plan into complete compliance with the SFA. However, according to a 2000 ruling in *American Oceans Campaign et al. v. Daley et al.* [Civil Action No. 99-982(GK)], EFH considerations continued to be inadequate in fishery management plans. The prosecution contested the adequacy of evaluations of fishing gear impacts on EFH and challenged NMFS approval of amendments and management plans which did not fully address the impacts of fishing on habitat. The U.S. District Court for the District of Columbia found that the agency's decisions on the subject EFH amendments were in accordance with the Magnuson-Stevens Act, but found that the EAs for the Councils' amendments were inadequate and in violation of NEPA. The court determined that the EAs prepared for the EFH provisions of the fishery management plans did not fully consider all relevant alternatives. The court specifically criticized several of the EAs for evaluating only two options for the EFH amendments: either approval of the amendment or status quo. Additionally, the decision noted that the descriptions and analyses of the environmental impacts of the proposed actions and alternatives were vague or not fully explained. The court ordered NMFS to complete a new and thorough NEPA analysis for each EFH amendment named in the suit. Amendments 11 and 12 addressed the SFA requirements for designating EFH for all managed species and for managing whiting (silver hake), red hake and offshore hake through a separate small-mesh multispecies management plan implemented in 2000.

Framework Adjustments and Interim Rule

The Northeast Multispecies FMP has been subject to many additional changes since its inception. Besides the 11 amendments implemented prior to development of Amendment 13, the multispecies plan has been altered through framework adjustments 30 times since 1994.

The Council has held four annual reviews and made eight adjustments to the FMP to address Amendment 7 rebuilding needs (Frameworks 20, 24, 25, 26, 27, 30 and 33). In 1999, the Council submitted Framework 27 as the primary annual adjustment framework. At the final framework meeting on January 27-28, the Council focused on the finalizing the severe restrictions necessary to achieve the plan objectives for GOM cod and was unable to complete development of the measures needed for GB cod. It followed immediately with the development of Framework 30 to address GB cod, which was submitted to NMFS on April 30.

Both Frameworks 27 and 30 contained trip limits for GOM and GB cod. In both cases, the Regional Administrator was authorized to reduce the trip limit when 75 percent of the target TAC for each stock was reached. On May 28, 1999, the Regional Administrator reduced the GOM cod limit implemented on May 1, 1999 of 200 pounds per day to 30 pounds per day, just three weeks into the fishing year. However, even before the trip limit was reduced, fishermen reported excessive discards of cod as seasonal closures ended.

On May 28, 1999, responding to widespread reports from the industry about the levels of cod discards in the western Gulf of Maine, the Council requested that the Secretary of Commerce increase the trip limit under the emergency action authority provided in §305 of the Magnuson-Stevens Act. On August 3, NMFS published an interim rule that increased the trip limit from 30 pounds per day to 100 pounds per day, with a maximum possession limit of 500 pounds and modifications to the running clock. The interim rule expired on January 30, 2000.

NMFS announced on July 29, 1999 that it disapproved the 30-day closure on Georges Bank proposed in Framework 30, but it approved the trip limit, which took effect on August 15. Framework 30 established a GB cod trip limit of 2,000 pounds per day/20,000 pounds maximum possession limit that the Regional Administrator may reduce when 75 percent of the target TAC is landed.

To address potential discarding in the GOM cod fishery upon expiration of the interim rule, and to prevent repeating on Georges Bank the discarding situation that occurred in the Gulf of Maine when the trip limit was reduced, the Council submitted Framework 31 on October 14, 1999. NMFS approved the increased GOM cod trip limit on January 5, 2000, but it disapproved the change to the GB cod trip limit program that would have eliminated the authority of the Regional Administrator to make mid-season adjustments to the trip limit when 75 percent of the target TAC is reached.

Framework 33 was implemented on June 1, 2000 to reduce or maintain fishing mortality rates for the five critical stocks below fishing mortality rebuilding targets established by Amendment 7. This framework continued the status quo seasonal closures for Gulf of Maine cod, but incorporated a "trigger" for additional closures: if 50 per cent of the target TAC was landed by July 31, the Cashes Ledge Closed Area would be closed in November and Blocks 124 and 125 would be closed in January. The WGOM closure was extended for an additional year, to April 30, 2002. GOM cod trip limits were held at 400 pounds per day with a maximum possession limit of ten times the daily limit. Party and charter vessels were required to obtain a letter of authorization to fish in any of the GOM closed areas, and a limited access vessel in this program was prohibited from fishing on a DAS while in possession of the letter. A GB cod trip limit of 2,000 pounds per day, not to exceed 20,000 pounds per tip, was also adopted. In addition, a closure of Blocks 109-114, 98, and 99 during May was implemented. The Council also proposed changes to the large mesh permit category, but these were not approved by NMFS.

The Multispecies Monitoring Committee (MSMC) reviewed stock status in November, 2000, and concluded that Amendment 7 fishing mortality targets were likely being met for GB cod, GB haddock, GB yellowtail flounder, and SNE yellowtail flounder. The fishing mortality of GOM cod could not be determined with precision because of extensive discards that were believed to have occurred in 1999 because of the low trip limit. The MSMC recommended that an annual adjustment not be made until the status of GOM cod could be determined.

GB cod was assessed in June 2001 and fishing mortality was reported to be slightly above the Amendment 7 target; subsequent assessments have shown this report to be in error. GOM cod was assessed in June 2001, and fishing mortality was found to be significantly above the F_{MAX} target for this stock. After receiving the information on GOM cod at the July, 2001 Council meeting, the Council renewed efforts to develop Framework 36. The initial plan was to determine final management measures at the September Council meeting. Just prior to this meeting, however, the National Marine Fisheries Service advised the Council that an Environmental Impact Statement (EIS) was required for this action. Scoping was immediately initiated and it was decided to incorporate the annual adjustment into this action. Framework 36 was completed by December 2001, but the Council did not adopt the framework and it was not submitted.

Frameworks 37 and 38 instituted changes to management of the whiting fishery.

Conservation Law Foundation et al. v. Evans et al.

In December 2001, Conservation Law Foundation and other organizations successfully filed suit against NMFS alleging that the rebuilding plans the NMFS implemented were not consistent with Amendment 9 overfishing definitions (*Conservation Law Foundation et al. v. Evans et al.*). Additionally, they charged that there had been a consistent failure in management plans to assess bycatch reporting and establish measures to minimize bycatch and bycatch mortality (when bycatch is unavoidable). After a long series of negotiations among various parties, interim measures were adopted by the court and NMFS was instructed to submit a management plan to comply with the law. The response to this is Amendment 13, which will address stock rebuilding issues, greatly reduce fishing effort and capacity in the multispecies fishery and implement additional measures to specifically address habitat protection.

Trawl Survey Issues and Amendment 13 Development

During the period of Amendment 13 development, the relationship between the multispecies fishing industry and the scientific community has also undergone important changes. In September 2002, a Cape Cod fisherman convinced federal scientists that the trawl warps used to tow the groundfish survey gear used by the Northeast Fisheries Science Center were of different lengths, a fact that was confirmed. A series of workshops took place to assess how the warp length discrepancy and confounding structural problems with the otter trawl doors and footrope may have affected data quality. Issues surrounding the trawl warps, reference point estimates, and a trawl survey experiment were evaluated by Payne et al. (2003) and the general conclusion was that the information available was suitable for management. Payne et al. (2003) also provided numerous recommendations for further investigation of the issues raised. It is likely that in the future, greater emphasis will be placed on collaborative efforts in fisheries research in order to improve communication and understanding among fishermen and scientists, and collect more comprehensive and complete data for management of the fishery. The problems with the survey trawls emerged at a critical time in the development of this amendment and have resulted in a series of setbacks to implementation of the plan. The court granted NMFS an eight-month extension in the date of implementation of the amendment to May 1, 2004 in order to reevaluate the biological data used in establishing biological reference points for the stocks.

Demonstrating abounding variety in its multitude of fishery participants, fishing communities, stocks and species, and individuals and organizations involved in management, the Northeast multispecies fishery is one of the most complex and colorful in this country. This diversity, which is implicit in the uniqueness of New England's fishing heritage, also creates challenges to equitability and simplicity in management. The evolution of groundfish management in New England has served to shape and transform all elements of the fishery.

2.2 Purpose and Need for Action

This amendment is designed to meet all the requirements of the M-S Act for the Northeast Multispecies Fishery. This amendment is prepared by the New England Fishery Management Council (NEFMC; Council). After the proposed action is reviewed, the Amendment will be approved and implemented by the National Marine Fisheries Service (NMFS). Stocks managed in this fishery are described in Amendments 5, 7 and 9. Specific alternatives are identified to:

- Rebuild overfished fisheries
- End overfishing where it occurs
- Minimize, to the extent practicable, the adverse effects of fishing on essential fish habitat to comply with section 303(a)(7) of the Magnuson-Stevens Act. More specifically, the purpose is to identify and describe adverse effects of fishing on EFH and to minimize to the extent practicable these adverse effects. This Environmental Impact Statement (EIS) responds, in part (see above), to the court's directive to NMFS to complete new NEPA analyses for the Northeast Multispecies Fishery Management Plan. Although the plaintiffs' complaint focused on whether NMFS had adequately evaluated the effects of fishing on EFH, NMFS decided to complete new EIS's to evaluate all of the EFH components of the applicable fishery management plans. Accordingly, this SEIS reevaluates the impacts of amending the Northeast Multispecies fishery management plans to include the EFH provisions required by the Magnuson-Stevens Act. The SEIS analyzes alternatives for the EFH FMP amendments, including the alternative that was adopted by the Council and approved by NMFS in 1999 and other alternatives.
- Minimize bycatch and minimize mortality of bycatch that cannot be avoided
- Provide options for reducing harvesting capacity
- Address numerous issues with respect to the administration of the fishery
- Implement management measures for tuna purse seine vessel access to groundfish closed areas, an expansion of the northern shrimp fishery exemption area, and an exemption for general category scallop vessels in southern New England.

Twelve groundfish stocks are either overfished, or have been declared overfished in the past and are currently rebuilding under programs that do not meet the requirements of the M-S Act. In addition to these stocks, two additional stocks are experiencing overfishing. Failure to reduce fishing mortality in order to rebuild these stocks and/or end overfishing will result in the loss of net benefits valued at $200 million or less (at a cumulative probability of 90 percent) over a 23 year period. While many stocks will continue to increase under current fishing mortality rates – indeed, some will increase to levels not observed in the last thirty years – most stocks will not achieve levels that will support maximum sustainable yields.

In the 1996 reauthorization of the Magnuson-Stevens Act, Congress recognized that one of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats. To ensure habitat considerations receive increased attention for the conservation and management of fishery resources, the amended Magnuson-Stevens Act included new EFH requirements, and each fishery management plan must now include specific EFH provisions. Section 303(a)(7) of the Magnuson-Stevens Act requires that each FMP describe and identify EFH for the fishery based on the guidelines established by the Secretary (50 CFR part 600, Subpart J), minimize to the extent practicable adverse effects on EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of EFH. The description an identification of EFH is applied as included in Amendment 11 to the Northeast Multispecies FMP of 1998.

2.2.1 The NEPA Analysis and Fishery Management Plan Actions

NEPA provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with Federal actions, and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. In addition to considering alternatives to end overfishing and rebuild overfished stocks, NMFS and the New England Fishery Management Council considered a wide range of alternatives designed to minimize, to the extent practicable, the adverse effects of fishing on essential fish habitat (EFH). As noted in the court's decision in *AOC v. Daley*, the alternatives NMFS must consider under NEPA are not restricted to the options originally presented in the fishery management plan amendments submitted by the Council. Additional alternatives were developed during the process, and analyzed in this document.

Amendment 13 is a complex action, and the measures that ultimately will be implemented are expected to have significant implications on the conduct of the fishery in the future. Therefore, the Council considered it critically important that the alternatives be well developed and thoroughly analyzed. The Council and NMFS are subject to a court-ordered deadline of May 1, 2004 to implement Amendment 13. In order to allow the Council staff and the Plan Development Team as much time as possible to complete the final analyses of all of the management measures, and because the stipulation requires that a 90-day public comment period be provided for the designation of the EFH alternatives, the Council, in consultation with NMFS, chose to provide to the public the analysis of the EFH alternatives for Amendment 13 as early as possible. The Council voted to submit the EFH DEIS (stand alone) for public comment at its March 2003 meeting. The NOA for the EFH EIS was published on April 4, 2003 (FR 03). The public comment period was ninety days from April 4 through July 2, 2003. Although the EFH DEIS did not contain the complete analysis for all of the management measures under consideration for Amendment 13, it did consider the impacts of the measures under consideration by the Council on EFH. The analyses for the remaining measures of Amendment 13 were completed for the Amendment 13 DSEIS in preparation for the July 2003 Council meeting, at which the Council adopted the DSEIS for Amendment 13 in its entirety. The DSEIS thus constituted another draft of the EFH DEIS. The public had a 45-day period to comment on the DSEIS, including the EFH alternatives included in the DSEIS, prior to the Council taking final action on Amendment 13 in November 2003. Thus, the public was afforded 135 days to comment on the EFH alternatives in Amendment 13. All comments received on the EFH DEIS and the full Amendment 13 DSEIS were considered by the Council in making its final decisions on the measures to be submitted in Amendment 13, and are summarized in Appendix XVII of this SEIS.

2.2.2 Notice of Intent and Scoping Process

NMFS published a Notice of Intent (NOI) to prepare a supplemental EIS for an amendment to the Northeast Multispecies FMP on February 23, 1999 (*Federal Register*, 64 FR 8788). Scoping comments were solicited by the Council through May 10, 1999. The NOI highlighted that Amendment 13 was being developed to rebuild overfished stocks, but also would address other issues raised during scoping. The primary issues raised during scoping, organized under major themes, were:

- General problems
  - Management plan is to complex, with too many rules and frequent changes
  - Cumulative socio-economic impacts of successive framework actions not analyzed
  - No mechanism in the FMP to expand/upgrade groundfish observer coverage
  - Uncertainty over stock delineation
  - Different perceptions over the role of target TACs

- Stock rebuilding:
  - Need to address M-S Act requirements for rebuilding programs
  - Management cycle not coordinated with stock assessment cycle
  - Management measures to rebuild weak stocks often preclude fishing for stronger stocks, resulting in excessive economic dislocation

- Fishing Effort and Capacity
  - Allocated DAS cannot be increased without jeopardizing rebuilding
  - Only 1/3 of allocated DAS used in 1998; unused allocations could be reactivated, countering rebuilding efforts
  - Difficult to resolve treatment of recent vs. historic participation in the fishery
  - DAS are not being used as the primary management tool
  - Inequities associated with DAS allocations and usage
  - Frontloading and running of the DAS clock decrease ability to estimate true fishing effort

- Allocation and Equity Issues
  - Equal application of regulations often results in unequal impacts
  - Application of different regulations to different fleet sectors often viewed as unfair
  - Measures often tied to specific gear sectors, yet harvest allocations are not assigned to gear sectors
  - Perceptions of inequity with regard to recreational vessel access to closed areas

- Closed Area Management
  - Difficult to spread conservation burden evenly across fleet sectors using closed areas
  - Closed areas force vessels to concentrate effort and fish less efficiently, intensifying competition and gear conflicts

- Trip Limits
  - Often result in excessive discards
  - Species-specific trip limits in a multispecies fishery often result in discarding
  - Difficult to design a trip limit for both large and small vessels
  - Difficult to enforce
  - Create incentives for derby style fishing if used as a "backstop"

- Experimental and Exempted Fisheries
  - Five percent bycatch standard will become increasingly difficult to meet as groundfish stocks recover
  - Process for obtaining an experimental permit is difficult and time-consuming
  - Difficulty of process discourages conservation engineering

- Fishing Gear and Selectivity
  - FMP does not provide incentives for fishermen to use more selective, less destructive gear
  - NO mechanism to increase accountability for bycatch
  - Difficult to match minimum fish sizes with appropriate minimum mesh size
  - Lack of adequate gear/selectivity information for all multispecies stocks/fisheries

NMFS published a NOI to prepare a supplemental EIS for the EFH components of the Northeast Multispecies and Atlantic Sea Scallop Fishery Management Plans on February 1, 2001 (66 FR 8568). The public comment period was open until April 4, 2001. NMFS (and/or the Council) solicited public comment to identify a range of alternatives for identifying and describing EFH and HAPCs and requested information on adverse effects of fishing activities on EFH and HAPCs. NMFS (and/or the Council) solicited public comment on appropriate management measures and alternatives to minimize, to the extent practicable, any adverse effects of fishing on EFH. NMFS (and/or the Council) held one public scoping meeting. The meeting occurred in Gloucester, MA on February 22, 2001. A summary of the public comments and primary issues raised during the meetings is in the Scoping Report (Appendix 9).

2.2.3 Overview of the EFH Elements of the DSEIS

Based in part on the issues identified during scoping, the DSEIS included an evaluation of the effects of fishing on EFH and an analysis of alternatives to minimize to the extent practicable the adverse effects on EFH from fishing. It incorporated and expanded on the information contained in the supplemental EIS for the EFH components of the Northeast Multispecies Fishery Management Plans. The DSEIS considered and evaluated alternatives to minimize adverse effects to the extent practicable and included consideration of measures such as closed areas, effort reductions and gear modifications. It constituted another draft of the EFH DEIS.

The analysis considers the proposed action, along with a range of other reasonable alternatives. Information from the 1998 EA (included in Amendment 11 to the Multispecies FMP) is reflected in this analysis. However, additional information and the selection of alternatives come from a review of the best scientific information available, including new information made available since the fishery management plan amendments were originally completed.

Sections 9.1 and 9.2 of the SEIS describes the affected biological and physical environment. This includes a discussion of the areas and habitat types in the area that EFH is designated. The section's description of the affected environment details the physical and biological resources affected by the alternatives, including a description of the Atlantic Coast shelf ecosystem, benthic habitat, fishery activity and relevant biological resources with an emphasis on benthic organisms.

Section 9.3.1.2 includes an evaluation of gear effects on EFH. Specifically, the section describes the gears used, distribution and use of the different gears, the types of gear effects, the vulnerability of the EFH to the gear type and a determination of the adverse effects of gears on EFH.

Section 3.7 of the SEIS describes the alternatives for minimizing the adverse effects of fishing on EFH. The section discusses significant issues associated with each alternative including those identified during scoping. The discussion of each alternative for minimizing the effects of fishing on EFH describes the associated fishery management measures. This section concludes with a discussion and explanation of alternatives that were considered but not carried forward for further analysis. The description of alternatives provides a broad summary and comparison of each alternative. Section 5.3.8 details the environmental consequences of each alternative for minimizing the effects of fishing on EFH. For each alternative to minimizing adverse effects of fishing on EFH, the chapter describes the practicability of the associated fishery management measures and evaluates the environmental consequences in relation to effects on EFH, the fishery, other fisheries, and protected resources. The discussion of potential impacts resulting from each alternative is presented in comparative form that clearly distinguishes the environmental consequences of each alternative. The discussion in Section 5.0 includes a description of the conservation benefits and the adverse impacts of the alternatives.

In Sections 5.3 and 9.3.1.8, the document also includes material to satisfy the requirements of the NMFS guidelines at 50 CFR part 600, Subpart J for mandatory requirements of an FMP to:

(1) Identify any fishing activities that are not managed under the MSA that may adversely affect EFH.

(2) Identify activities other than fishing that may adversely affect EFH. For each activity, the FMP should describe known and potential adverse effects to EFH.

(3) Identify actions to encourage the conservation and enhancement of EFH, including recommended options to avoid, minimize, or compensate for the adverse effects, especially in HAPCs.

(4) List the major prey species for the species in the fishery management unit and discuss the location of prey species' habitat. Consider adverse effects on prey species and their habitats that may result from actions that reduce their availability, either through direct harm or capture, or through adverse effects to prey species' habitats.

(5) Recommendations, in priority order, for research effects necessary to improve upon the description and identification of EFH, the identification of threats to EFH from fishing and other activities ad the development of conservation and enhancement measures for EFH.

(6) Conduct a cumulative impact analysis that describes impacts on an ecosystem or watershed scale (Cumulative effects of multiple gear types in included in the Gear Effects Evaluation Section)

Appendix 17 includes a summary of comments received on the EFH DEIS and preliminary responses to those comments.

2.3 Goals and Objectives

The goals and objectives of this amendment are:

Goal 1: Consistent with the National Standards and other required provisions of the Magnuson-Stevens Fishery Conservation and Management Act and other applicable law, manage the northeast multispecies complex at sustainable levels.

Goal 2: Create a management system so that fleet capacity will be commensurate with resource status so as to achieve goals of economic efficiency and biological conservation and that encourages diversity within the fishery.

Goal 3: Maintain a directed commercial and recreational fishery for northeast multispecies.

Goal 4: Minimize, to the extent practicable, adverse impacts on fishing communities and shoreside infrastructure.

Goal 5: Provide reasonable and regulated access to the groundfish species covered in this plan to all members of the public of the Untied States for seafood consumption and recreational purposes during the stock rebuilding period without compromising the Amendment 13 objectives or timetable. If necessary, management measures could be modified in the future to insure that the overall plan objectives are met.

Goal 6: To promote stewardship within the fishery.

Objective 1: Achieve, on a continuing basis, optimum yield (OY) for the U.S. fishing industry.

Objective 2: Clarify the status determination criteria (biological reference points and control rules) for groundfish stocks so they are consistent with the National Standard guidelines and applicable law.

Objective 3: Adopt fishery management measures that constrain fishing mortality to levels that are compliant with the Sustainable Fisheries Act.

Objective 4: Implement rebuilding schedules for overfished stocks, and prevent overfishing.

Objective 5: Adopt measures as appropriate to support international transboundary management of resources.

Objective 6: Promote research and improve the collection of information to better understand groundfish population dynamics, biology and ecology, and to improve assessment procedures in cooperation with the industry.

Objective 7: To the extent possible, maintain a diverse groundfish fishery, including different gear types, vessel sizes, geographic locations, and levels of participation.

Objective 8: Develop biological, economic and social measures of success for the groundfish fishery and resource that insure accountability in achieving fishery management objectives.

Objective 9: Adopt measures consistent with the habitat provisions of the M-S Act, including identification of EFH and minimizing impacts on habitat to the extent practicable.

Objective 10: Identify and minimize bycatch, which include regulatory discards, to the extent practicable, and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

2.4 Changes from the Draft Amendment and DSEIS

This final amendment and FSEIS differ from the draft amendment and DSEIS in several ways. First, the proposed action is identified. Second, the document has been edited and re-organized to clearly identify the proposed action and alternatives not selected. Finally, additional analyses and discussion have been added to support the proposed actions. These changes are a result both of public comments and actions taken by the Council.

A large number of comments were received on the draft amendment and DSEIS. Most of these comments were in support of a particular alternative or proposed measure; those comments were noted. Additional comments were received questioning the analysis or the tools used to analyze the impacts of various alternatives. The volume of comments prevented an individual response, so the comments were summarized and addressed in Appendix XVII.

For the most part, the proposed actions have been selected from the alternatives described in the draft amendment. A major difference, however, is in the choice of rebuilding trajectories (or strategies) and the management measures for the commercial fishery designed to achieve those objectives. The draft amendment proposed selecting one rebuilding trajectory and applying it to all overfished stocks. Public comments suggested combining the adaptive and phased rebuilding trajectories by applying each only to specific stocks. Comments also were received suggesting appropriate management measures to achieve the mortality rates consistent with the combined trajectories. The Council considered these comments and is proposing a rebuilding approach based in large measure on these suggestions. Both a phased and adaptive trajectory have been adopted, applied to specific stocks. In addition, the trajectories have been modified somewhat to take into account the mortality reductions expected from the proposed measures and to incorporate new information on the observed fishing mortality rates in calendar year 2002. The phased trajectory has been modified into a stepped approach, addressing the practical difficulty of continuously reducing fishing mortality by a small amount each year on a number of stocks. The proposed management measures also differ from those suggested during the comment period. Based in large measure on the Alternative 1 rebuilding measures, they have been modified to include the necessary measures to reduce fishing mortality in future years as called for by the adaptive and phased trajectories. The proposed action also includes an innovative use of a limited number of DAS to target healthy stocks, an idea generated during the comment period. There are minor revisions to other management measures as well, both as a result of public comments and additional Council consideration of these issues. For example, specific details of the various special access programs have been clarified, as have the elements of the Georges Bank hook sector.

The document has been re-organized to clearly identify the proposed action and non-selected alternatives. The proposed action is described first. Non-selected alternatives are grouped into two categories: those that were not selected, and those that were considered and rejected. Generally, non-selected alternatives were analyzed in the draft amendment document and that analysis is included in this FSEIS. Alternatives that were considered and rejected were not analyzed in the DSEIS, but the reason for their rejection is briefly described. With respect to analyses, major elements of the biologic and economic analysis have been separated for the proposed action and non-selected alternatives. For less substantive issues, the analyses have not been separated but which measures are proposed or not selected have been identified in the discussion.

Additional biologic and economic analyses have been incorporated for the combined rebuilding strategies and the proposed commercial fishing management measures. These impacts are also compared to the impacts of the other management alternatives that were not selected. Additional analyses have been added to address the comment that the impact analysis did not consider impacts on Maine should vessels relocate to other ports. The social impacts of the DAS allocations and the use of DAS to target healthy stocks are also addressed. The bycatch analysis has been updated for the proposed action, and data on dogfish bycatch from a recent assessment has been added to the summary of bycatch information. Additional habitat analyses have been added for the proposed action, and corrections have been made to some of the habitat information based on a review of the public comments.

2.5 Stock Status

Through the course of development of this amendment, there has been considerable public comment that the scientific advice used as the basis for the amendment did not reflect the observations of fishermen. This concern was elevated when, in September 2002, NMFS notified the Council that the trawl warps used in the trawl survey were not accurately marked. This amendment is based on the estimates for stock status provided Groundfish Assessment Review Meeting (GARM) report (NEFSC 2002b). The GARM compared recent trawl survey results to previous years and did not detect noticeable differences. Issues surrounding the trawl warps, reference point estimates, and a trawl survey experiment were evaluated by Payne et al. (2003) and the conclusion was that the scientific information available was suitable for management. Payne et al. (2003) also provided numerous recommendations for further investigation of the issues raised. While not all these recommendations have been completed, because of the conclusions of Payne et al. (2003) this document is based on stock status as described in NEFSC 2002b and as updated by subsequent assessments. Stock status is discussed in detail in section 9.2.1.1.

The type of action required depends in part on the status of the stocks when compared to status determination criteria. Formal rebuilding programs are only required for stocks that are overfished - that is, less than the threshold biomass – or stocks that were previously declared overfished. While the Council considered three alternatives for determining threshold biomass, the proposed action is based on the estimates of B_{MSY} recommended by NEFSC (2002a).

2.6 The Future – Habitat Omnibus Amendment Components

In 2004, the Council will initiate a Habitat Omnibus Amendment that will be considered Amendment 14 to the Multispecies FMP. It will also amend the Sea Scallop (Amendment 11), Monkfish (Amendment 3), Herring (Amendment 2), Skate (Amendment 1), Red Crab (Amendment 1) and Atlantic Salmon (Amendment 2) FMPs. This Omnibus Amendment will be completed by the deadline specified in the AOC vs. Daley settlement agreement and, tentatively, will contain the following components:

- **Description and identification of EFH**

  Consideration of a range of alternatives for EFH designations
  Update all NMFS Source Documents for Species Reports

- **Non-Magnuson-Stevens Act fishing activities that may adversely effect EFH**

  Update current section on identifying any fishing activities that are not managed under the MSA that may adversely affect EFH.

- **Non-fishing related activities that may adversely effect EFH**

  Update current section on identifying activities other than fishing that may adversely affect EFH. For each activity, the FMP should describe known and potential adverse effects to EFH.

- **Conservation and enhancement**

Update current section on identifying actions to encourage the conservation and enhancement of EFH, including recommended options to avoid, minimize, or compensate for the adverse effects, especially in HAPCs.

- **Prey Species**

Review and update the current list the major prey species for the species in the fishery management unit and discuss the location of prey species' habitat. Consider adverse effects on prey species and their habitats that may result from actions that reduce their availability, either through direct harm or capture, or through adverse effects to prey species' habitats.

- **Research and Information Needs**

Review and update the current recommendations, in priority order, for research effects necessary to improve upon the description and identification of EFH, the identification of threats to EFH from fishing and other activities ad the development of conservation and enhancement measures for EFH.

- **Development and adoption of a habitat susceptibility and recovery index for the Northeastern US**

- **Identification of habitat areas of particular concern (HAPCs)**

This will be done through the HAPC process approved by the Council and included in a formal RFP. The RFP will be initiated in NOI for the Omnibus Amendment 2 and terminated 6 months later.

- **Consideration and identification of Dedicated Habitat Research Areas**

May consider using the same type of process as the HAPC process and work closely with the Research Steering Committee on this effort.

- **Integrate alternatives to minimize the adverse effects of fishing on EFH, to the extent practicable, across all NEFMC FMPs.**

3.0 Proposed Action

The Council intends to address a wide range of management issues through this amendment. In order to organize the measures proposed to address these issues, they are discussed in five broad categories:

- Clarification of status determination criteria and adoption of formal rebuilding programs for overfished stocks: The rebuilding programs in this section are the basis for development of management measures to rebuild overfished fisheries and end overfishing.
- Fishery program administration: measures developed to address issues that are primarily administrative in nature, though some may have biological, social, or economic impacts.
- Measures to reduce capacity: measures developed by the Council to control fishing capacity.
- Measures to achieve stock rebuilding: measures designed to comply with M-S Act requirements to rebuild overfished fisheries, and end overfishing where it is occurring.
- Measures that minimize, to the extent practicable, adverse effects of fishing on habitat
- Other issues: measures developed to alter restrictions on two exempted fisheries and one exempted gear.

3.1 Clarification of Stock Status, Status Determination Criteria and MSY Control Rules

This section establishes the underlying basis for the other management measures that are being considered. The criteria used to determine stock status and the target fishing mortality rates that result from the control rules and rebuilding strategies are used to define the biological objectives. Management measures - restrictions on fishing activity - are then designed to achieve those biological objectives. The stock biomass goals and maximum fishing mortality targets ultimately bound the catches that can be taken.

3.1.1 Reasons Clarification Is Necessary

Amendment 9 adopted overfishing definitions for the stocks managed by the Northeast Multispecies Fishery Management Plan (FMP) to bring the FMP into compliance with the requirements of the M-S Act. There has been considerable confusion, however, on the interpretation of the overfishing definitions adopted through Amendment 9. This confusion complicates the determination of stock status.

In brief, the Sustainable Fisheries Act amended the Magnuson-Stevens Act in 1996 to require that fishery management plans specify objective and measurable criteria for when the fishery to which the plan applies is overfished. The Council convened an Overfishing Definition Review Panel (Panel) in 1997 to provide the Council guidance on this requirement. The Panel reviewed existing overfishing definitions and concluded that many did not meet the new legal requirements, so revised overfishing definitions were recommended. The Panel's Overfishing Definition Report (OFD) was provided to the Council in June 1998 (Applegate et al. 1998) and the Council subsequently considered these recommendations for its management plans. The Council's adoption of new overfishing definitions was accomplished through the adoption of new FMPs or amendments to existing FMPs, and not merely by acceptance of the Panel's report. Amendment 9 to the Northeast Multispecies Fishery subsequently adopted overfishing definitions to meet SFA requirements that are based on the report of the Panel.

At the same time that the Panel was meeting, the National Marine Fisheries Service (NMFS) was updating its guidance on the National Standards Guidelines (NSGs) to reflect the changes in the SFA. Proposed guidelines were published on August 4, 1997, and the final guidelines were published on May 1, 1998. As a result of this timing, the Panel was only able to review the final guidelines at its last meeting. As a result, there are differences in terminology and approach between the final NSGs and the OFD. The OFD briefly discussed some of these differences, and also commented on the substance of the guidelines.

As a result of the differences among the first three documents, there has been considerable confusion on the interpretation of the Amendment 9 overfishing definitions and their use to determine stock status. Much of this confusion is because the three documents do not use the same terms, or use them in different ways. The following table lists the major differences.

OFD	Amendment 9
• Does not define when a stock is "overfished" • Does not define "overfishing" as when fishing mortality exceeds the threshold defined by the relevant control law • Use of "rebuilding period" differs from "rebuilding program" in NSG1 • "Minimum biomass threshold" is different than NSG1 "minimum stock size threshold" • Incorrectly interprets NSG1 guidance for stocks that cannot rebuild in ten years	• According to a court ruling, defines "overfished" as when biomass is less than the target biomass • Does not define biomass threshold • Uses term "control laws" from OFD rather than "MSY control rules" as used in NSG1 • Does not state when numerical estimates of parameters will be updated • Does not define how index-based proxies are calculated • Maximum rebuilding period for halibut and redfish is not consistent with NSG1

Table 1 – Summary of inconsistencies between Applegate et al (1997), Amendment 9, and NSG1

Further complicating the situation was the application of different analytic techniques in March, 2002 to estimate status determination criteria parameters (NEFSC 2002a). These techniques resulted in suggestions to change both the parameters and numerical estimates of those parameters for all groundfish stocks. In some cases, the revised biomass targets were outside the range of stocks sizes observed during the assessment time horizon (generally since the 1960s). Consternation over these new targets, as well as other concerns over the science underpinning the amendment, led to a formal peer review of the biomass targets, stock assessments, and trawl surveys in February 2003. A formal independent peer review of revised biological reference points, stock assessments, and trawl surveys was conducted in February 2003.The report of that peer review is subject to differing interpretations.

The immediate issues that should be addressed are:

(1) One sentence in a discussion paragraph in Amendment 9 states that a stock is overfished if the biomass is less than the biomass necessary to produce maximum sustainable yield (B_{MSY}). Since "overfished" is not defined in the report of the Panel, this apparently is an extension of the approach taken by the Panel that suggests fishing mortality should be reduced in order to increase stock size when the stock is at a biomass less than B_{MSY} (Applegate et al. 1998). This definition differs with the definition established by NMFS and published in the NSGs, which defines a stock as overfished when the biomass is less than the minimum biomass threshold.

(2) Amendment 9 defines threshold fishing mortality as less than or equal to the fishing mortality rate that can produce maximum sustainable yield and that varies with stock size. In the text and in Table 2 of Amendment 9, it states that overfishing occurs when the fishing mortality exceeds the threshold fishing mortality for a given stock size. Table 2 thus defines overfishing in terms of a control rule that takes into account the current stock biomass and the propensity of the stock to recover to MSY conditions within a specified time frame. Table 1 identifies the relevant biomass and fishing mortality targets and thresholds that define the key points on the control rules identified in Table 2. Table 1 includes a "threshold" fishing mortality, which is the maximum fishing mortality for a rebuilt stock and is not to be exceeded under any conditions. NMFS interprets the threshold fishing mortality in Table 1 as defining a maximum fishing mortality rate that does not vary with stock size, and uses that criteria to determine if overfishing is occurring.

(3) Amendment 9 defined stock reference points as parameters (such as "1/2 B_{MSY}" or "F_{MSY}") and listed current numerical estimates of these parameters. The amendment is not clear on when the numerical estimates of the parameters will be re-estimated. Numerical estimates of the parameters are typically re-evaluated during the Stock Assessment Workshops (SAW), and reviewed by the Stock Assessment Review Committee (SARC). There has been confusion over whether these re-estimates replace the values in Amendment 9.

(4) Some of the overfishing definitions in Amendment 9 are index-based proxies. The Council's Overfishing Definition Review Panel (Applegate et al 1998) recommended the use of a three year moving average when estimating stock status using index proxies, however, the Amendment is not clear on how those proxies are calculated – that is, are they based on an average or a one year value.

(5) The maximum rebuilding period for halibut and redfish should be corrected to reflect the NSG guidance for stocks that cannot rebuild in ten years or less in the absence of any fishing pressure.

(6) The *Final report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish* (NEFSC 2002a) applied different methods for evaluating status determination criteria, recommended changes to those criteria, and provided numerical estimates. This information needs to be incorporated into the management plan in some fashion.

In order to minimize confusion, the Council establishes the following status determination criteria and MSY control rules for the Northeast Multispecies Fishery.

3.1.2 When is a stock overfished?

A stock is "overfished" when the actual size of the stock or stock complex in a given year falls below the minimum stock size threshold or reasonable proxy thereof. This is consistent with current guidance in NSG1. If this definition is not consistent with future revisions in NSG1, the Council will make necessary changes through a framework action.

<u>Rationale</u>: This statement clarifies when a stock is overfished and is consistent with current NMFS guidance.

3.1.3 When is overfishing occurring?

"Overfishing" occurs when the fishing mortality rate exceeds the maximum fishing mortality threshold for a period of one year. These maximum fishing mortality thresholds are shown in Table 2. Requirements for Council action are specified in NSG1. If this definition is not consistent with future revisions to NSG1, the Council will make necessary changes through a framework action.

Rationale: Under the proposed definition, overfishing occurs when the fishing mortality rate exceeds the maximum fishing mortality threshold for a period of one year. This value remains constant over the range of possible stock sizes. From a management standpoint, the proposed action is easy to administer, since the point at which overfishing occurs remains constant. In addition, it is consistent with the current NS1 guidelines.

3.1.4 Optimum Yield

No changes are being made to the definition of optimum yield as justified in Amendment 9 and approved by NMFS with approval of that document. Optimum yield for a stock is achieved when fishing at the target fishing mortality for a given stock size.

3.1.5 Maximum Sustainable Yield

Maximum sustainable yield (MSY) is defined by the National Standards Guidelines (NSGs) (50 CFR 600.310) as the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions. If possible, MSY must be defined for each stock. The current estimates of MSY shown in Table 4 for groundfish stocks are based on the *Final Report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish* (NEFSC 2002a). These MSY estimates will only be possible if stocks rebuild to the target biomass recommended in the report.

3.1.6 Status Determination Criteria

Discussion: Status determination criteria define appropriate biomass and fishing mortality levels for the stock to insure sustainable harvests. The NSGs (50 CFR 600.310) require specification of two criteria: a minimum stock size threshold (or a proxy), and the maximum fishing mortality threshold (or a proxy). Minimum stock size thresholds are often specified as some fraction of the biomass level that will produce MSY (B_{MSY}). B_{MSY} is commonly referred to as the *biomass target*, though this term is not used or defined in the NSGs and at present there is no explicit requirement to specify this value. According to the NSGs, the minimum stock size threshold should be equal to the greater of the following: one-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within ten years if the stock or stock complex were exploited at the maximum fishing mortality threshold specified. The maximum fishing mortality threshold is frequently based on the fishing mortality rate (F) that produces MSY (F_{MSY}).

These criteria were first defined in Amendment 9 to the Northeast Multispecies FMP. For most stocks, Amendment 9 defined criteria such as BMSY and FMSY based on the results of surplus production models, as developed and explained in Applegate et al (1998). Since adoption of these criteria, a number of technical limitations have emerged that are detailed in the *Final Report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish* (NEFSC 2002a). To briefly summarize the major issues:

- A need to make the reference points as consistent as possible with the age-based assessments used for many groundfish stocks. Reference points based on surplus production models could not be used for stocks with age-based assessments.

- Estimates of Bmsy generated by surplus production methods tend to be limited to the range of observed values. For fisheries such as groundfish that have been heavily exploited for a considerable period of time, this may under-estimate the true potential of the stock.
- Several authors have suggested that when estimating management parameters, a wide range of candidate models and approaches should be evaluated.
- Since the adoption of the original status determination criteria, a more thorough understanding of the NSGs has evolved.

Action: As a result of these issues, the Council proposes to amend status determination criteria for multispecies stocks. Status determination criteria are defined as parameters that identify a specific biological element of a stock. The defined parameter should not be confused with the numerical estimate of that parameter. For most stocks with age-based assessments, the parameters are based on spawning stock biomass at MSY (SSB_{MSY}) as a proxy for B_{MSY}, and fully-recruited fishing mortality that produces MSY (F_{MSY}). Estimates for F_{MSY} may be based on proxy fishing mortality rates (such as F40% or F50%). For those stocks without an age-based assessment, trawl survey indices and exploitation indices (landings divided by trawl survey index) are used as proxies for B_{MSY} and F_{MSY}. The proxy for stock size usually uses a three-year average of the survey index; for halibut, a five-year moving average is used. Relative fishing mortality rates are calculated based on the catch divided by the stock size estimate. The calculation of the three-year (or other time period) moving average will be documented in the baseline assessment performed by a SARC. That method will be used until an alternate is approved through a peer reviewed process (SARC or other peer review).

The third element of the status determination criteria is the minimum biomass threshold. Amendment 9 included minimum biomass thresholds that were less than ½ B_{MSY}, the recommended lower limit specified in the National Standards Guidelines (NSGs). Applegate et al. (1998) concluded that this was justified because of the rebuilding potential of many groundfish stocks, but also recommended that if a stock falls below this level, fishing mortality be reduced to as close to zero as possible. Minimum biomass thresholds of less than ½ B_{MSY} are not consistent with the NSGs.

The status determination criteria parameters for groundfish stocks are as shown in Table 2. This table reflects changes to the parameters and increases all minimum biomass thresholds to at least half the target biomass.

3.1.6.1 Revisions to status determination criteria

Section 303(a)(10) of the M-S Act assigns the drafter of a fishery management plan the responsibility for specifying the objective and measurable criteria (e.g. status determination criteria) for determining when a fishery is overfished:

> *"Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, shall—*
>
> ** * **
> *(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery)…"*

Some confusion has resulted from a failure to adhere to the principle that it is a Council responsibility to establish the criteria for determining stock status. Amendment 9 implemented status determination criteria for groundfish stocks, generally using the parameters of B_{MSY} and biomass-weighted F_{MSY}. Since approval of Amendment 9, various scientific panels have recommended the use of different parameters such as SSB_{MSY}, fully-recruited fishing mortality, or an index-based proxy. While the Council has never formally adopted any of these other parameters, the NMFS has used the scientific recommendation as the basis for determining stock status. As a result, status determinations have been based on criteria that have not been reviewed, subject to public comment, implemented, or even formally approved by the NMFS. This creates considerable uncertainty over exactly what criteria is being used to evaluate performance of the management plan.

Action: Over time, development of new analytic techniques or additional data may result in scientific advice recommending changes to the status determination criteria parameters. In order to comply with M-S Act requirements that status determination criteria be determined by the Council, a Council action is necessary to change the status determination criteria parameters. The types of changes that will require a Council action include:

- Changing the parameter (such as using B_{MSY} instead of SSB_{MSY}, or biomass weighted F instead of fully recruited F, or an index-based measure rather than a B_{MSY} or SSB_{MSY}, or an index based on a different part of the stock)
- Substituting a biomass ratio (such as an ASPIC production output ratio of B/BMSY) rather than using units defined in the parameter (such as metric tons of SSB or total biomass)

If a report is received suggesting a change in the parameters (such as a SARC Advisory Report or other document), the change will be submitted to the Council for review and adoption through a framework or other management action. Determinations of stock status will be based only on approved and implemented criteria – that is, changes suggested by the SARC Advisory Report or other document will not be used to determine stock status until adopted through a Council amendment or framework action. As noted in earlier paragraphs, the parameter should not be confused with its numerical estimate.

This is not a change from the current system as understood by the Council and required by law. It is merely a clear statement on how changes to parameters will be adopted.Changes to the fundamental parameters should not be confused with changes in the numerical estimates of those parameters. In essence, changes to Table 2 require a Council action, but changes to the numerical estimates in Table 4 do not. The exception to the latter will be any changes that result from the 2008 review of status determination criteria (described in section 3.1.7).

Stock	Biomass Target	Minimum Biomass Threshold	Maximum Fishing Mortality Threshold	Fishing Mortality Target
GOM Cod	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
GB Cod	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
GB Haddock	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
GOM Haddock	B_{MSY} Proxy/Fall Trawl Survey Index	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
GB Yellowtail Flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
Cape Cod/GOM Yellowtail Flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
SNE/MA yellowtail flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
American Plaice	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
Witch Flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
Gulf of Maine Winter Flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
GB Winter Flounder	B_{MSY}	½ Btarget	F_{MSY} (1)	75% of F_{MSY}
SNE/MA Winter Flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
Acadian Redfish	SSB_{MSY}	½ Btarget	$F_{50\%}$ proxy for F_{MSY}	75% of F_{MSY}
White Hake	B_{MSY} Proxy/Fall Survey Index (> 60 cm fish)	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index (> 60 cm fish)	75% of F_{MSY}
Pollock	B_{MSY} Proxy/ Fall Survey Index	½ Btarget	F_{MSY} Proxy/ Relative Exploitation Index	75% of F_{MSY}
Windowpane Flounder (North)	B_{MSY} Proxy/Fall Survey Index	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
Windowpane Flounder (South)	B_{MSY} Proxy/Fall Survey Index	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
Ocean Pout	B_{MSY} Proxy/Fall Survey Index	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
Atlantic Halibut	B_{MSY}	½ Btarget	F_{MSY} (1)	75% of F_{MSY}

Table 2 – Proposed status determination criteria parameters for groundfish stocks.
Fully recruited fishing mortality unless otherwise noted. See text for calculation of B_{MSY} proxy based on trawl survey index, and F_{MSY} proxy based on exploitation index.

1. Biomass weighted fishing mortality

3.1.6.2 Numerical Estimates of Status Determination Criteria

3.1.6.2.1 Overview

In order to provide an objective basis for measurement, numerical values of the status determination parameters must be estimated. In addition to suggesting that parameters for most stocks should be based on SSB_{MSY} or fully-recruited fishing mortality, NEFSC 2002a reviewed the technical basis for the status determination criteria and developed point estimates for nineteen of twenty groundfish stocks. There are significant differences in the point estimates for both target biomass and fishing mortality thresholds between NEFSC 2002a and the approach used by Applegate et al. 1997 (as updated). For many stocks, the target biomass increased and the fishing mortality threshold decreased.

With respect to target biomass levels, NEFSC 2002a notes that the new estimates rely on recruitment distributions that are either near the long-term mean or that are correlated with increases in projected spawning stock biomasses. NEFSC 2002a also reported:

> "For many of the stocks the proposed biomass reference points are in *terra incognita* – chronic growth overfishing has limited stock biomasses to well below their estimated potential. Given the lack of experience in observing these populations at high biomass, we can only model the expected behavior of the system under varying assumptions. The NEFMC is advised that an adaptive approach to biomass management is a prudent tactic to explore the implications of higher biomasses and to find the point of diminishing returns to yields as a function of increased stock density. The adaptive approach recommended is to build the spawning stock biomasses by reducing fishing mortality (or in some cases maintaining current rates) such that the realized recruitments at high spawning stock biomasses are observed. This will allow direct examination of recruitment associated with maximum sustainable yield and thus the appropriateness of recruitment levels used to set biomass reference points.
>
> Given the histories of most of these stocks, there is likely substantial biomass growth and commensurate increases in catch, before these points are reached. Continued monitoring of vital population rates - including growth, sexual maturity at age, feeding habits to reveal predation and competition among populations, and distribution patterns in relation to abundance – will indicate when biomass production becomes limited by density-dependent factors…Thus, the panel recommends that the NEFSC adopt the revised biological reference points recommended herein, and evaluate the rebuilding process at periodic intervals."

The Council referred NEFSC 2002a to its Science and Statistical Committee (SSC) for review and advice on how to incorporate the reports recommendations into groundfish management. Noting the extensive amount of scientific work represented in the report, the SSC concluded it was the most comprehensive treatment of the subject of overfishing and rebuilding reference points yet produced. The SSC went on to say:

> "In general, we believe this report provides useful information for management decision making. Additional work is needed specifically to explore the implications of uncertainty in the stock recruitment relationship."

In February 2003, the proposed reference points were reviewed by a panel of scientists. This panel did not prepare a consensus summary – instead, each panelist prepared an individual report and the chair summarized the key elements in an executive summary (Payne et al 2003). Some common themes concerning the status determination criteria in most of the individual reports include the following:

- The analytic methods used in NEFSC 2002a are generally sound, though some could be improved or were misapplied in specific situations.
- There is considerable uncertainty over the reference points recommended in NEFSC 2002a – particularly biomass targets – partly as a result of available data.
- The current management system places great reliance on accurate biomass targets. The Council should carefully consider the risks of adopting high biomass targets.
- Because of these risks, an adaptive approach should be considered.

The reports are not clear on what is meant by an "adaptive" approach, with at least two different descriptions used by the reviewers. One form suggested is to establish a biomass target that moves towards those suggested by NEFSC 2002a but that lies within, or just above, the range of observed biomass. Another form suggested is to monitor stock increases through identified waypoints and evaluate the accuracy of the biomass targets based on progress through those waypoints.

3.1.6.2.2 Revised Estimates

Discussion: In order to provide an objective basis for measurement, numerical values of the status determination parameters must be estimated. NEFSC 2002a reviewed the technical basis for the status determination criteria and developed recommended point estimates for nineteen of twenty groundfish stocks. There are significant differences in the point estimates for both target biomass and fishing mortality thresholds between NEFSC 2002a and the approach used by Applegate et al. 1997 (as updated). For many stocks, the target biomass increased and the fishing mortality threshold decreased.

Action: The Council will adopt the numerical estimates of the status determination criteria that were determined by NEFSC 2002a. For GOM winter flounder, the criteria were determined by SAW 36, and for white hake, the GARM (NEFSC 2002b) provided additional information. These values are shown in Table 4.

Stock	Biomass Target (B_{MSY} or proxy)		Fishing Mortality Threshold (Fmsy)		Basis for Reference Points
	Amend-ment 9	NEFSC 2002A/ Proposed	Amend-ment 9	NEFSC 2002A/ Proposed	
Gulf of Maine Cod	22,100[1]	82,800	0.27[4]	0.23	Parametric S-R
Georges Bank Cod	83,500[1]	216,800	0.32[4]	0.18	Parametric S-R
Georges Bank Haddock	105,000	250,300	0.26	0.26 (F40%)	Empirical Non-parametric
Gulf of Maine Haddock	8.25 kg/tow	22.17 kg/tow	0.29 (C/I)	0.23 (C/I)	Catch-Survey Proxy
Georges Bank Yellowtail Flounder	35,200[1]	58,800	0.33[4]	0.25 (F40%)	Empirical Non-parametric
Southern New England/Mid-Atlantic Yellowtail Flounder	36,600 (SNE YTF only)	69,500	0.23[4]	0.26 (F40%)	Empirical Non-parametric
Cape Cod/GOM Yellowtail Flounder	4,200[1] (CC YTF)	12,600	0.40[4]	0.17 (F40%)	Empirical Non-Parametric (mean)
American Plaice	24,200	28,600	0.19	0.17 (F40%)	Empirical Non-parametric (mean)

Table 3 – Summary of current, recommended/proposed (NEFSC 2002A) biomass and fishing mortality rate reference points for New England groundfish stocks.

All proposed biomass targets are in spawning stock biomass units or trawl survey indices unless otherwise noted. All recommended fishing mortality thresholds are in fully-recruited fishing mortality unless otherwise noted.

1. Biomass target established based on total biomass; value shown is SSB equivalent, metric tons
2. Total biomass, metric tons
3. Unit is total stock biomass for fish >= 60 cm., mt
4. Unit is biomass weighted F

Stock	Biomass Target		Fishing Mortality Threshold (Fmsy)		Basis for Reference Points
	Amend-ment 9	NEFSC 2002A/ Proposed	Amend-ment 9	NEFSC 2002A/ Proposed	
Witch Flounder	21,800[1]	25,240 (SAW 37)	0.106[4]	0.23 (F40%)	Empirical Non-Parametric (mean)
Southern New England Winter Flounder	11,800[1]	30,100	0.37[4]	0.32	Parametric S-R
Georges Bank Winter Flounder	2.49 kg/tow	9,400[2]	1.21 (C/I)	0.32[4]	Surplus Production
GOM Winter Flounder	NA	4,100	NA	0.43	Parametric S-R
Acadian Redfish	108,000[1]	236,700	0.116[4]	0.04 (F50%)	Empirical Non-Parametric (mean upper Q)
White Hake[5]	14,700	14,700 [3/] 7.70 kg/tow	0.29[4/] 0.55 C/I	0.29[4]	Surplus Production
Pollock	102,000	3.0 kg/tow	0.65[1]	5.88 (C/I)	Catch-Survey proxy
N. Windowpane	0.94 kg/tow	0.94 kg/tow	1.11 (C/I)	1.11 (C/I)	Catch-Survey proxy
S. Windowpane	0.41 kg/tow	0.92 kg/tow	2.24 (C/I)	0.98 (C/I)	Catch-Survey Proxy
Ocean Pout	4.9 kg/tow	4.9 kg/tow	0.31 (C/I)	0.31 (C/I)	Catch-Survey Proxy
Atlantic Halibut	5,400[2]	5,400[2]	0.06	0.06	Catch-YPR proxy

Table 3 (cont.) – Summary of Amendment 9, recommended/proposed (NEFSC 2002A) biomass and fishing mortality rate reference points for New England groundfish stocks.

All proposed biomass targets are in spawning stock biomass units or trawl survey indices unless otherwise noted. All recommended fishing mortality thresholds are in fully-recruited fishing mortality unless otherwise noted.

1. Biomass target established based on total biomass; value shown is SSB equivalent, metric tons
2. Total biomass, metric tons
3. Unit is total stock biomass for fish >= 60 cm., mt
4. Unit is biomass weighted F
5. Survey based equivalents developed by GARM 2002

SPECIES	STOCK	NUMERICAL ESTIMATE OF STATUS DETERMINATION CRITERIA				
		B_{TARGET} (metric tons)	$B_{THRESHOLD}$ (metric tons)	F_{MSY} (Maximum fishing mortality)	Ftarget (at biomass target)	MSY (metric tons)
COD	GB	216,800	108,400	0.18	0.14	35,200
	GOM	82,800	41,400	0.23	0.17	16,600
HADDOCK	GB	250,300	125,150	0.26	.20	52,900
	GOM	22.17 kg/tow	11.09 kg/tow	0.23C/I	0.17 C/I	5,100
YELLOWTAIL FLOUNDER	GB	58,800	29,400	0.25	0.19	12,900
	SNE/MA	69,500	34,750	0.26	0.20	14,200
	CC/GOM	12,600	6,300	0.17	0.13	2,300
AMERICAN PLAICE		28,600	14,300	0.17	0.13	4,900
WITCH FLOUNDER		25,240	12,620	0.23	0.17	4,375
WINTER FLOUNDER	GB	9,400(1)	4,700	0.32	0.24	3,000
	GOM	4,100	2,050	0.43	0.32	1,500
	SNE/MA	30,100	15,050	0.32	0.24	10,600
REDFISH		236,700	118,350	0.04	0.03	8,200
WHITE HAKE[3]		14,700(2) 7.70 kg/tow	7,350 3.35 kg/tow	0.29 0.55 C/I	0.22 0.41 C/I	4,200
POLLOCK		3.0 kg/tow	1.5 kg/tow	5.88 C/I	4.41 C/I	17,600
WINDOWPANE FLOUNDER	North	0.94 kg/tow	0.47 kg/tow	1.11 C/I	0.83	1,000
	South	0.92 kg/tow	0.46 kg/tow	0.31 C/I	0.23 C/I	900
OCEAN POUT		4.9 kg/tow	2.95 kg/tow	0.31 C/I	0.23 C/I	1,500
ATLANTIC HALIBUT		5,400(1)	2,700	0.06	0.4	300

Table 4 - Numerical estimates of status determination criteria for the Multispecies FMP.

These estimates will be periodically updated through the assessment process and adopted through Council action. Option. Refer to Table 3 to determine units.

1) Biomass level based on total biomass
2) > 60 cm fish
3) Survey based equivalents from GARM 2002

3.1.7 Review of Status Determination Criteria

Discussion: Regardless which biomass targets are selected, there is a need to plan for review of the targets. Any adaptive approach to the determination of biomass targets for rebuilding stocks requires periodic review of the performance of stock status and changes in vital rates that may influence the attainment of biomass goals. This option sets forth a process to monitor and review the pace of stock rebuilding of overfished resources and some population attributes to be considered in such reviews.

NEFSC 2002a proposed that an adaptive approach be used to periodically evaluate the ability of the stock to attain the target biomass for stocks whose biomass targets are set at levels higher than that observed in the time series of abundance indices. Specifically, information on the following population parameters is available for many of the important groundfish species:

- length and weight at age
- condition factor (weight in relation to length)
- maturity-at-age
- stomach contents
- relative abundance
- recruitment
- spawning biomass
- environmental conditions (temperature, salinity)
- geographic distribution
- ecosystem interactions as a condition of status determinations
- simultaneous achievement of all stocks to the B_{MSY} level

Changes in one or more of these parameters may influence the ability of the stock to reach target spawning biomasses, and the time frame necessary to reach the target. Considerations in conducting such reviews are the ability to discern trends in parameters from normal year-to-year variation (due to sampling variability), and the development of a process to conduct and peer review such analyses. The critical technical issue is the ability to discern if and when density dependence in growth, maturity and natural mortality is occurring, and the implications of density dependence for biomass targets. Likewise, if long-term environmental conditions influence resource productivity, they may also influence target biomasses.

Action: Based on the above considerations, a four to five year review cycle will be used for re-evaluation of biomass reference points for these stocks. This would allow a "mid course" evaluation in 2008, with respect to the 2014 rebuilding time frames for most of the groundfish stocks. If the review is undertaken in 2008, there will be five additional observations of year class strength, and associated population and environmental data (e.g. through 2007). The review of these references points should be synchronized to the schedule for "benchmark" assessments if possible, so that adequate technical review is afforded to the assessment basis for evaluating reference points.

The structure of such analyses and peer review can take many forms – a working group with integrated external peer review (similar to the structure used for the 2002 re-evaluation), or a two part analyses and peer review process. Because (presumably) there will not the complicating factors of timing with regards to court orders, the latter process is considered preferable. The working group will include a wide cross section of technical experts, including representatives from the NEFMC and MAFMC staffs and state agencies. The proposed working group could include a wide cross section of experts. A peer review of the WG report could be conducted by NMFS headquarters (Office of Science and Technology), the CIE, or other appropriate scientific entity. Composition of the working group and formation of the peer review must be approved by the Council and NMFS. For this review, any updated numerical estimates will be adopted through a Council management action (amendment or framework adjustment).

As noted in section 3.4.2.2 below, an assessment update of the groundfish complex will be conducted in 2005 for potential management action in 2006. This assessment will include a full and independent review of an age-structured production model developed by Dr. Doug Butterworth. This assessment update will not update the numerical estimates of status determination criteria unless the review of Dr. Butterworth's work justifies reconsideration. Benchmark assessments, including a review of the status determination criteria, will be conducted in 2008 for implementation in 2009. Both the update assessments in 2005 and the benchmark assessments in 2008 will be subject to peer review by independent scientists.

3.1.8 MSY Control Rules

"MSY control rules" required by the NSGs provide advice to the Council on fishing mortality rates that are likely to achieve MSY in the long-term. During the development of management alternatives, the Council will use these MSY control rules as guidance for determining biological goals for management actions. Management measures, however, will be developed only after consideration of all biological, economic, and social goals of the management plan and consistent with all National Standards. The MSY control rules proposed in this amendment are based on the control rules promulgated in Amendment 9 because development of new MSY control rules were not included in the Terms of Reference for NEFSC 2002a. They will become effective on implementation of the Amendment. The Council will review these control rules in the future and may revise them if necessary through a future management action.

The Council will use the fishing mortality rates in Table 5 as a guide for management actions and will strive to achieve the mortality targets associated with these control rules. At a minimum, the Council will design management measures to lower fishing mortality to less than the fishing mortality defined by the MSY control rule, and will strive to achieve the fishing mortality target specified in Table 2 as applied to the MSY control rule mortality for the current stock biomass. There is no time line associated with achieving the fishing mortality rates associated with these control rules. The Council does not intend that exceeding these thresholds or targets will be classified as overfishing (unless the fishing mortality rate also exceeds the maximum fishing mortality threshold listed in Table 2, consistent with when overfishing occurs). Optimum yield is defined in Amendment 9 as fishing at the target fishing mortality for the current biomass. Fishing mortality rates that exceed the thresholds defined in Table 5 over the long-term will not be consistent with the management plan and will require Council action because optimum yield is not being achieved. For overfished stocks, the Council may implement a mortality reduction and rebuilding plan that differs from the MSY control rule but that achieves the rebuilding objectives of the FMP. This rebuilding plan will be developed in a framework or amendment to achieve biological, economic, and social objectives. Such a plan will rebuild overfished stocks or stock complexes consistent with legal requirements.

Discussion: This measure clarifies the parameters used for status determination criteria, consistent with the definitions that define overfishing and when a stock is overfished. Table 5 treats all groundfish stocks on a consistent basis with respect to MSY control rules, as opposed to Amendment 9, which applied different rebuilding trajectories for stocks that are not overfished.

3.1.9 Maximum Rebuilding Period

Consistent with the NSGs, the maximum rebuilding period for any stock that cannot rebuild in ten years or less in the absence of any fishing mortality will be the time it will take to rebuild in the absence of fishing mortality, plus one mean generation. If necessary to comply with future revisions to the NSGs, this definition will be modified through a future Council action.

Rationale: This change makes the multispecies management plan consistent with the National Standards guidelines.

SPECIES	STOCK	MSY CONTROL RULE
COD	GB	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
	GOM	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
HADDOCK	GB	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
	GOM	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
YELLOWTAIL FLOUNDER	GB	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{msy}
	SNE	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{msy}
	MID-Atl.	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
	Cape Cod	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
AMERICAN PLAICE		F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
WITCH FLOUNDER		F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
WINTER FLOUNDER	GB	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
	GOM	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{msy}
	SNE/MA	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{msy}
REDFISH		F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
WHITE HAKE		F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{msy}
POLLOCK		F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
WINDOWPANE FLOUNDER	North	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
	South	F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
OCEAN POUT		F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy} < B < B_{target}
ATLANTIC HALIBUT		F=0 until stock is rebuilt (provisional control law)

Table 5 - MSY control rules

For all stocks, when stock size is less than the threshold biomass the F will be as established by the formal rebuilding program.

3.2 Proposed Rebuilding Programs for Overfished Stocks

The M-S Act and NSGs require the Council to define formal rebuilding programs or plans for stocks that are below the minimum biomass threshold (overfished). These programs define how the Council will rebuild those stocks to the target biomass within the statutory time frame. The Council has approached this issue in two steps. The first step, described in this section, is to identify the fishing mortality strategy that the Council will use as the basis for management measures that will rebuild the stock. The second step is to adopt management measures to achieve these strategies. The formal rebuilding program consists of both elements – they should not be viewed independently. Once a stock is defined as overfished, a rebuilding program must be continued until the stock reaches the target biomass. During the rebuilding programs, adjustments can be made through the annual adjustment process based on the condition of the stock and consistent with this Amendment, as long as statutory requirements are met.

When possible, long-term projections were used to estimate future stock size and landings. Long-term projections are sensitive to the assumptions used in their development and should not be viewed as precise predictions of future stock conditions. Actual future recruitment and the fishing mortality that occurs before implementation of Amendment 13 could result in future stock conditions that differ from the projection results.

3.2.1 Formal Rebuilding Programs

Summaries of stock status for groundfish stocks are in section 9.2.1.1. The M-S Act requires a formal rebuilding program for stocks that are overfished. The determination of whether a stock is overfished - stock size is less than the minimum biomass threshold – depends on the numerical estimate of B_{MSY} and the criteria chosen for the minimum biomass threshold. Another criteria to be considered is whether the stock was previously declared overfished. If a stock was previously declared overfished, <u>and</u> has not rebuilt to the proposed target biomass, a formal rebuilding program is necessary even if the stock is not currently overfished.

The following table (Table 6) identifies those stocks for which formal rebuilding programs are required. This table is based on the GARM (NEFSC 2002b). In two cases there are differences between the information in this table and that contained in the 2002 Report to Congress on Status of Stocks. The Report to Congress did not use assessment information for determining stock status, relying on information in the Report of the Working Group on Biological Reference Points (NEFSC 2002a). This Report said that plaice was <u>not</u> overfished and that pollock <u>was</u> overfished. The GARM, on the other hand, was an assessment meeting that was specifically charged to make status determinations. GARM 2002 concluded that in 2001 plaice was overfished and pollock was not. The following tables reflect the information from the GARM. Because the conclusions of the GARM rely on more current available scientific information, it is being used to make status determinations used in this amendment rather than the Report to Congress, which is based on less current data and assessments.

For each stock, if there is a "yes" in either column, a formal rebuilding program is required. Both columns are shown so it is clear which criteria led to the determination that a formal rebuilding program is required. GB yellowtail flounder is unusual, in that it was previously declared overfished but was rebuilt to the then-current estimate of B_{MSY} in 2001 (TRAC 2001, MSMC 2001). Since the stock was rebuilt prior to the re-estimation of reference points, and is greater than the minimum biomass threshold, a formal rebuilding program is not required for this stock.

Summarizing Table 6, the stocks that require a formal rebuilding program are:

GOM cod, GB cod, GOM haddock, GB haddock, CC/GOM yellowtail flounder, SNE/MA yellowtail flounder, American plaice, white hake, SNE/MA winter flounder, redfish, windowpane flounder (south), ocean pout, Atlantic halibut

The lack of a defined formal rebuilding program for stocks that are not overfished should not be construed as meaning that the Council is ignoring these stocks. The Council will insure fishing mortality remains below the fishing mortality threshold for these stocks. In all cases, these thresholds are defined as F_{MSY} or a suitable proxy for F_{MSY}. As noted by Restrepo et al (1998), "F_{MSY} is the fishing mortality rate that maximizes long-term yield under a constant-F policy, and B_{MSY} is the equilibrium biomass expected when fishing constantly at F_{MSY}." Controlling fishing mortality below the threshold should result in stock size fluctuating around the estimate of B_{MSY} over the long term. This is clearly shown in the age-based projections for stocks that are not under formal rebuilding programs (see section 5.2.3). This is approach is consistent with both the M-S Act and the National Standard 1 Guidelines.

Because of a lack of information, it is not possible to develop a formal rebuilding program for Atlantic halibut. The Council has adopted a provisional control rule that reduces fishing mortality on Atlantic halibut to as close to 0 as possible.

SPECIES	STOCK	Was Stock Overfished in 2001?	Was stock previously declared overfished and has not reached proposed biomass target?
Cod	GB	***Yes***	***No***
	GOM	***Yes***	***No***
Haddock	GB	***Yes***	***Yes***
	GOM	***Yes***	***Yes***
Yellowtail Flounder	GB	No	No*
	SNE/MA	***Yes***	***Yes***
	CC/GOM	***Yes***	***No***
American Plaice		***Yes***	***No***
Witch Flounder		No	No
Winter Flounder	GB	No	No
	GOM	No	N/A
	SNE/MA	***Yes***	***No***
Redfish		***No***	***Yes***
White Hake		***Yes***	***No***
Pollock		No	No
Windowpane Flounder	North	No	No
	South	***Yes***	***Yes***
Ocean Pout		***Yes***	***Yes***
Atlantic Halibut		***Yes***	***Yes***

Table 6 – Required formal rebuilding programs, based on minimum biomass threshold Option 2 (1/2 Btarget for all stocks). Formal rebuilding program required for stocks that have a "yes" in either column under a specific biomass target option.

3.2.2 Rebuilding Timelines

The M-S Act requires that for a fishery that is overfished, any fishery management plan, amendment, or proposed regulations shall:

> "…specify a time period for ending overfishing and rebuilding the fishery that shall…be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock of fish within the marine ecosystem."

Action: Rebuilding programs will be developed to rebuild most overfished stocks with a median (50 percent) probability by 2014. There are three exceptions to the 2014 end date: Georges Bank cod, Cape Cod/GOM yellowtail flounder, and Acadian redfish. These stocks will have longer rebuilding periods.

Rationale: The guidelines to National Standard 1 clearly state that rebuilding programs for overfished stocks begin when the regulations adopting those programs are implemented (50 CFR 600.310(e)(4)(ii)(C)). This action is consistent with that guidance. This action is planned for implementation on May 1, 2004. In addition, there are practical reasons to use this starting date for rebuilding. Initial M-S Act overfishing definitions were adopted under Amendment 9 and implemented in November, 1999. Amendment 9 did not include measures to achieve these rebuilding targets. Indeed, the *CLF vs. Evans et al.* lawsuit argued that the lack of measures to implement the Amendment 9 definitions did not comply with the M-S Act. This lawsuit was not resolved until May, 2002. There has also been extensive further scientific work on the status determination criteria that have considerably changed the understanding of the biology of the groundfish complex. For example, the target biomass for several stocks – GOM cod, GB cod, and GB haddock – doubled or tripled when re-estimated by NEFSC 2002b from previous values. This created considerable uncertainty over the appropriate biomass targets and delayed implementation as those issues were addressed through a peer review process.

The M-S Act and the NSGs require that any time period for ending overfishing and rebuilding the fishery shall be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock within the marine ecosystem. This option recognizes that the shortest possible rebuilding period, taking into account the needs of fishing communities, is ten years. Analysis of different rebuilding periods showed that net economic benefits increase by $40 million if rebuilding periods are extended until 2014 vice 2009 (see section 5.4.3). Additional analyses showed that all of the proposed alternatives will reduce gross revenues, resulting in negative impacts on fishing communities. As a result, the Council believes it appropriate to extend the rebuilding period to mitigate, in part, the economic impacts of the rebuilding programs. Using a ten year rebuilding period results in an ending date of 2014 for most stocks that require a formal rebuilding program.

Another reason to extend the rebuilding programs is the change in numerical estimates of B_{MSY}. Under most alternatives for biomass targets, there are significant increases. This change in the understanding of the biology of the stocks warrants extending rebuilding programs to the maximum length allowed by the M-S Act.

Rebuilding periods for GB cod, CC/GOM yellowtail flounder, and Acadian redfish are extended consistent with the M-S Act and NSG1 as explained below.

> Georges Bank cod: Projections show that this stock can only be rebuilt by 2014 at very low levels of fishing mortality (similar to 0.05). Because this is a trans-boundary stock and is fished by Canada, this fishing mortality may only be achieved if all U.S. fishing on this stock is eliminated and Canadian fishing is kept at very low levels. Effectively, this is a fishing mortality of 0 for U.S. fishermen. This triggers the exception in NSG1 which allows the period to be extended to the length of time it takes to rebuild in the absence of fishing plus one mean generation. This is calculated to be 2026.
>
> CC/GOM yellowtail flounder: Projections show this stock can only be rebuilt by 2014 at very low levels of fishing mortality (similar to 0.08). Because of the small size of the stock, this limits fishing to several hundred metric tons. This could only be achieved if all fishing – including fishing for non-groundfish species such as scallops – is stopped in the CC/GOM yellowtail stock area. This rebuilding mortality is thus effectively 0. This triggers the extended rebuilding period authorized by the NSGs. The rebuilding period is calculated to end in 2023.
>
> Acadian redfish: Because of the slow growth of this stock, it cannot rebuild by 2014 even if all fishing mortality is eliminated. The rebuilding period is determined as the time necessary to rebuild in the absence of any fishing mortality, plus one mean generation. The end of the period is calculated to be 2051.

3.2.3 Rebuilding Trajectories for Overfished Stocks

There are an infinite variety of ways to alter fishing mortality so that a stock will rebuild within the legally required time frame. The Council considered three variations:

- Constant fishing mortality rate: Fishing mortality is held to the level that is projected to achieve the target biomass in the desired time period. If the stock increases as projected, catch will increase over time. Correctly designed management measures should remain relatively constant over the time period.
- Phased fishing mortality reduction: Fishing mortality is reduced over time so that the target biomass is achieved in the desired time period. Management measures will become progressively more stringent over the early years in the rebuilding period.
- Adaptive rebuilding strategy approach: Fishing mortality is held at F_{MSY} through 2008 for all stocks that require formal rebuilding programs. After an evaluation of the rebuilding program in 2008, mortality is adjusted to an Frebuild that will achieve biomass targets in the time required by the M-S Act.

A fourth option – constant catch rate – was considered and rejected (see section 4.2.1).

In order to calculate a rebuilding trajectory, the target biomass and time necessary to rebuild must be defined. The Council based rebuilding trajectories on the biomass targets recommended in NEFSC 2000a. The Council considered analyzing rebuilding trajectories with greater than a median (50 percent) probability of achieving the biomass targets recommended by the Reference Point Working Group. This was considered unreasonable and the Council rejected this approach for the following reasons. First and foremost, for many stocks, the rebuilding fishing mortalities at the median level require large reductions in fishing mortality – in excess of 50 percent from current fishing mortality. In order to achieve a higher probability of achieving the target, even greater reductions would be necessary. The social and economic implications of the rebuilding programs are already substantial, and larger reductions in mortality would threaten the continued existence of the groundfish fishery. As discussed later in this document, the present value of the economic net benefits of rebuilding are already marginal and might be negative if more severe mortality reductions are adopted. Given the multispecies nature of the fishery, further reductions in fishing mortality for stocks such as GB cod or GOM cod would result in further reducing catches for stocks that do not need reductions (e.g. GB haddock, GOM haddock, GB yellowtail flounder). Given that the goal of the M-S Act remains achieving OY, the Council believes its selection of rebuilding trajectories is more consistent with this goal. Second, the projection methodology used to generate the strategies is subject to uncertainty, and how well the projections perform with respect to actual stock response is not well understood. While in some cases the projections may be optimistic and overstate rebuilding potential, in other cases they may be pessimistic. These variations are likely to occur from stock to stock. Absent an understanding of how the projection models perform on a stock-by–stock basis, it is not possible to determine the appropriate probability that should be selected. Payne et al. (2003), while concluding that the projection methodology was generally sound, also noted projections should be validated against historical observations of stock dynamics since the projections are based in large measure on the stock recruit relationship observed at MSY rather than during the rebuilding phase. In another comment, Payne et al (2003) noted that a key issue yet to be resolved is the number of years into the future that the projection approach can be deemed to give reliable results. Third, in the case of some stocks, choosing a higher probability of rebuilding success may actually delay rebuilding and/or relax the rebuilding program. For stocks in a depressed condition (such as SNE/MA yellowtail flounder), it may not be possible to rebuild by 2014 with a high probability of success. This would then trigger an extension to the allowed rebuilding period.

The biological success of the rebuilding programs will be measured using two criteria:

- The rebuilding fishing mortality rate must be achieved. This criterion is necessary for two reasons. First, for some stocks, fishing mortality must be reduced below the maximum fishing mortality threshold to end overfishing. Second, only if this target fishing mortality is achieved will the Council be able to make valid judgments concerning the appropriateness of the biomass targets recommended by NEFSC 2002a.
- The target biomass is achieved within the appropriate time period.

3.2.3.1 Combined Rebuilding Trajectories

In public comments received on the draft Amendment 13 DSEIS, the suggestion was made that the Council should use a combination of rebuilding trajectories, rather than use one form of trajectory for every stock. In response to these comments, the Council has decided to use a combination of the phased and adaptive trajectories as described in the following sections. Section 3.2.3.1.1 describes the theoretical basis for the phased fishing mortality reduction. Section 3.2.3.1.2 describes the theoretical basis for the adaptive strategy. Section 3.2.3.1.3 describes the Council's proposed action, which is based on the theory behind the phased and adaptive strategies but adapts those strategies to reflect the expected impacts of the proposed management measures in section 3.6.1.

3.2.3.1.1 Phased fishing mortality reduction

This strategy steadily reduces fishing mortality during the rebuilding period in order to achieve the target biomass with a median probability. When the stock achieves its target biomass, the formal rebuilding program adopted because the stock was overfished will be completed. Once the stock achieves the target biomass, fishing mortality targets will be based on the status determination criteria and MSY control rule. The fishing mortality for the rebuilding program may be adjusted if there are <u>substantial</u> changes in stock status and recruitment from those used in the long-term projections used to estimate this fishing mortality. Stock condition should be evaluated over at least a two-year period to smooth fluctuations that are the result of variability rather than true trends. A wide variety of variables will be considered to determine stock condition: fishing mortality and biomass (including the uncertainty around the estimates), recruitment patterns, environmental conditions, etc.

Current estimates of the mortality rates necessary to rebuild groundfish stocks are shown in Table 7. The formula used can be described in algebraic terms as:

$$F_{2003} = a * F_{2002}$$

$$F_{2004} = a * F_{2003}$$

$$F_{year} = F_{2004} * e^{\left[-l\,(year-2004)+m(year-2004)^2\right]}$$

Values for l and m were selected for each stock to ensure that the median spawning biomass trajectory reached its target value in the last year of the rebuilding program.

In concept, the phased reduction approach can be extended to index-based stocks that require formal rebuilding programs. For ocean pout and southern windowpane flounder, the current landings, landings at the biomass target, and the landings needed to rebuild are so low that this becomes little more than an academic exercise. In the case of GOM haddock, the current exploitation ratio is less than that necessary to rebuild by 2009 or 2014; fishing mortality can increase under the proposed rebuilding program, and there is no benefit to a phased reduction approach.

The phase reduction strategy will be used for the following stocks:

- GB cod
- American plaice
- CC/GOM yellowtail flounder
- SNE/MA yellowtail flounder
- White hake

The fishing mortality rates for the phased rebuilding strategy that were included in the draft amendment document are shown in Table 7. One difficulty with using a phased rebuilding strategy is that the reduction in mortality that is needed each year differs from stock to stock. This makes it difficult to develop effort controls that will precisely achieve the desired reductions. As a result, the measures designed to achieve the phased reduction strategy can only approximate the calculated reductions over time. In the draft amendment document, Alternative 1 included options for implementing a phased strategy that reduced used DAS over four consecutive years to approximate the phased strategy. Comments were received that this approach was very different from that suggested by Table 7, and it was questioned whether these measures could be considered implementing that strategy. As a result of these comments and the practical difficulties of implementing a phased strategy, the Council is not following the trajectories shown in Table 7.

SPECIES	STOCK		Fishing mortality for phased rebuilding program									
		Assumed F2002/2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Cod	**GB**	**0.45**	0.43	0.40	0.38	0.36	0.34	0.32	0.28	0.24	0.22	0.22
	(add ten years)		0.22	0.22	0.22	0.20	0.20	0.20	0.18	0.16	0.16	0.16
	GOM	0.36	0.32	0.29	0.27	0.25	0.23	0.22	0.21	0.21	0.21	0.21
Haddock	GB	0.20	0.22	0.22	0.22	0.22	0.22	0.24	0.24	0.24	0.24	0.24
	GOM											
Yellowtail Flounder	GB	0.14										
	SNE/MA	**0.74**	0.50	0.40	0.30	0.25	0.20	0.17	0.17	0.17	0.17	0.17
	CC/GOM	**0.95**	0.73	0.57	0.45	0.36	0.29	0.24	0.20	0.17	0.15	0.13
	(add ten years)		0.11	0.10	0.09	0.09	0.09	0.09	0.08	0.09		.09
American Plaice		**0.26**	0.23	0.20	0.18	0.16	0.16	0.14	0.14	0.14	0.14	0.14
Witch Flounder	No formal rebuilding program required											
Winter Flounder	GB	No formal rebuilding program required										
	GOM	No formal rebuilding program required										
	SNE/MA	0.45	0.35	0.29	0.25	0.22	0.21	0.20	0.22	0.24	0.25	0.27
Redfish		<0.01										
White Hake												
Pollock	No formal rebuilding program required											
Windowpane Flounder	North	No formal rebuilding program required										
	South											
Ocean Pout												
Atlantic Halibut	Insufficient information to calculate rebuilding mortality											

Table 7 – Original phased reduction fishing mortality rebuilding program, rebuilding most stocks by 2014.

3.2.3.1.2 Adaptive Rebuilding Strategy

NEFSC 2002a provided estimates of B_{MSY} that are beyond the observed range of stock biomasses. Although these estimates of B_{MSY} are based on demonstrated recruitment and current growth and fishery selection parameters, there remains uncertainty in the direction of these critical population rates under stock rebuilding, and thus in the ability of the stocks to attain the calculated B_{MSY} values. The calculated B_{MSY} values may be too high or too low, depending on how dynamic rates of recruitment, growth and natural mortality are as the stock complex is rebuilt. NEFSC 2002a recognized these uncertainties and suggested an adaptive approach be adopted. Similarly, the Peer Review (Payne et al. 2003) reiterated the uncertainty of high targets and also suggested an adaptive approach.

By definition, fishing a stock at or below F_{MSY} will eventually result in the attainment of B_{MSY}, with the stock thereafter fluctuating at or around that value, depending on rates of recruitment and fishing mortality. By allowing the stock to equilibrate when fished at these rates, more information regarding the actual biomasses associated with F_{MSY} will follow. Based on NEFSC 2002a and the recent *Peer Review of Groundfish Science* (Payne et al. 2003), estimates and proxies for F_{MSY} (Table 4) are robust to uncertainty in B_{MSY} and are appropriate thresholds for management. Therefore, attaining fishing mortalities at or below these rates is the cornerstone of this option. The extension of the stock rebuilding time frames (e.g., to ending dates of 2014 for most stocks) allows for fishing plans that are consistent with an overall strategy of initially fishing the stocks at or below F_{MSY}, and adjusting either the fishing rates or the biomass reference points, consistent with the pace of rebuilding relative to the nominal targets. If a 2014 time frame is assumed for all stocks (e.g., 2004-2014 rebuilding period) except GB cod (2004-2026), redfish (2004-2051), and CC/GOM yellowtail flounder (2004-2023), then the strategy of fishing at or below F_{MSY} for a significant portion of the rebuilding period becomes more viable as a strategy, thereby minimizing the influence (and reliance) on a particular value of B_{MSY}.

The proposed strategy outlined in Table 8 and Table 9 below and Figure 1 and Figure 2 implements the following fishing scenario:

(1) Fishing mortality rates for all stocks are maintained at or below F_{MSY} for the first 5 years of the plan (2004-2008). In 2009-2014, the fishing mortality rates are adjusted to those required to meet B_{MSY} targets initially estimated for the stocks (Table 8) with a 50% probability by the end of the rebuilding period. The Frebuild adopted in 2009 will be estimated in 2003 and will be the default value adopted unless the 2008 evaluation suggests a different value (lower or higher) is appropriate. This strategy will, on average, result in the attainment of B_{MSY} by 2014 for most stocks with a 50% probability, all things being equal (e.g. recruitment growth, natural mortality). The rebuilding program will be judged successful if biomass at the end of the rebuilding period lies within the inter-quartile range (range between the 25^{th} and 75^{th} percentiles of biomass) of the projected 2014 biomass.

(2) As shown in Figure 1 and Figure 2 and Table 8, there is a median rebuilding path that is described by the results of stochastic population projections under the various fishing scenarios. This path is essentially a series of "way-points" upon which the pace of stock rebuilding can be judged. The values of "SSB_{2008}" represent, then, an interim biomass target along the path to stock rebuilding that can be used as an appropriate benchmark to evaluate the efficacy of the rebuilding program. Analyses of progress towards achieving the final B_{MSY} targets by the end of the rebuilding period wall be based on management measures adopted to achieve the median estimate of biomass at the 5—year waypoint, not the upper or lower quartile of those way-point estimates.

(3) In early calendar year 2008 progress towards rebuilding the stocks is formally assessed. Based on the findings of that review, one of three determinations can be made:

(a) the stocks are “on track” to rebuilding -that is, the point estimate of 2008 stock biomass lies within the inter-quartile range (range between the 25th and 75th percentiles of biomass in 2008) of the *projected* 2008 biomass (estimated in 2003), consistent with the proposed rebuilding trajectory,
(b) the stock is above the projected strategy, or
(c) the stock is below the proposed rebuilding trajectory.

One key assumption for this strategy is that overfished stocks are not required to be rebuilt prior to 2014.

Depending on the actual stock biomass in 2008, there are a number of default management and scientific actions that are prescribed (Figure 1 and Figure 2). One of the critical elements to be assessed is whether the management program has been successful in achieving F_{MSY} or below for individual stocks. This is important since the condition of the stock and the specific management actions are dependent on the causal factors contributing to the observed stock biomasses. For example, if the stock size in 2008 is judged to be significantly below the projected path, the critical question is why? If fishing mortality rates were consistently and significantly above F_{MSY}, the question to be assessed is if F_{MSYs} *were* attained, would the stock condition intersect the rebuilding path? Alternatively, is there evidence in population dynamics data (recruitment, growth, natural mortality) that show no significant improvement in the stock could have occurred, due to these stock conditions, even though the stock was overfished. The management and scientific responses in these cases may be different.

A brief set of potential factors associated with all nine possibilities for stock and fishing mortality rate conditions during 2008 are given in Figure 1. The intent of this figure is to depict some of the obvious factors that might be influencing the stock, depending on fishery or natural phenomena. These factors would be examined in detail in developing appropriate adaptive management advice pertaining to the second half of the rebuilding period (e.g. 2009-2014). Figure 2 provides pre-defined (default) management and/or scientific review actions that are proposed as a key element of the adaptive approach. These defaults are intended to be illustrative, rather than restricting management response to only the listed actions. These outcomes are conditional on the status of the stock biomass relative to the interim (2008) waypoints, and the 2002-2008 fishing mortality rates relative to F_{MSY}. The nine possible situations (cells of Figure 2) are reviewed briefly below. These responses are not intended to pre-empt the planned review of reference points described in section 3.1.7.

$F_{2004\text{-}2008} > F_{MSY}$ and $B_{2008} > B_{waypoint}$

In this situation the fishing mortality rates for 2002-2008 have exceeded the F_{MSY} values, but the stock is judged to be above the median rebuilding path (way point). This condition may arise due to exceptional recruitment or other biological factors that offset the continued overfishing of the stock. In this case, the management action would be to reduce F to F_{MSY}. More analysis would be required to see if the fishing mortality on the stock should be reduced further to the rebuild value originally projected for the stock (Table 8). Also, it is possible that F_{MSY} or B_{MSY} may have originally been set too low, and re-consideration of the evidence should be done before fishing rates are reduced (e.g. for 2009-2014).

$F_{2004\text{-}2008} > F_{MSY}$ and $B_{2008} = B_{waypoint}$

In this case, F exceeds F_{MSY} but the stock is on the rebuilding trajectory. The default management advice is to reduce F to the F rebuild value, or, if it can be demonstrated to be appropriate, to the F_{MSY} value, <u>whichever is higher</u>. In this situation, stock conditions are apparently offsetting the continued overfishing. This would most likely be due to greater than expected recruitment. While there may be some justification to revise B_{MSY} and F_{MSY} values, they are not likely to be different from those currently in place. The exception may be F_{MSY}, which may need to be re-evaluated if the partial recruitment pattern (gear selectivity-at-age) changes due to additional gear restrictions.

$F_{2004-2008} > F_{MSY}$ and $B_{2008} < B_{waypoint}$

The condition of excessive fishing mortality and biomass below the projected rebuilding path would require, at a minimum, reduction of F to the original F rebuild value. In this case, there may be appropriate analyses to evaluate if the stock would have been on the rebuilding path had overfishing not been occurring. This could be accomplished by simulating the combined impacts of the observed recruitment stream and the F_{MSY} values. If the stock would have been near the path had the stock not been overfished, the managers may consider the feasibility of additional F reductions (below the original Frebuild values) to allow the stock to regain the rebuilding path.

$F_{2004-2008} = F_{MSY}$ and $B_{2008} > B_{waypoint}$

If the fishing mortality rate is held at F_{MSY} for 2002-2008 and the stock is above the rebuilding path, the managers should consider suspending the default reduction in F to Frebuild. Simulations could determine if stock rebuilding to B_{MSY} would be impeded by such a strategy. This scenario is likely to occur due to one or more exceptional year classes spawned, and may, or may not indicate that revisions in B_{MSY} (upward) are warranted (although they would not apply to the 2014 rebuilding program).

$F_{2004-2008} = F_{MSY}$ and $B_{2008} = B_{waypoint}$

In this condition, F targets have been achieved and stock rebuilding is on track. The prescriptive advice would be to reduce F to F rebuild, but new F rebuilds should be considered if the stock can be fished at a higher rate (than the original F rebuild) and still attain the target.

$F_{2004-2008} = F_{MSY}$ and $B_{2008} < B_{waypoint}$

If fishing mortality rate targets are met and the stock lags below the rebuilding trajectory, the nominal management advice is to reduce F to the original F rebuild value. Specific conditions in the stock should be re-evaluated to determine why stock biomass has not responded. Three potential causal factors are (1) continued below-average recruitment due to poor environmental conditions (e.g., regime change), (2) multispecies effects such as increased predation on juveniles or (3) competition with other species for food, resulting in reduced growth rates, or other population dynamics factors. In this case, scientists should re-consider biomass and fishing mortality rate targets in light of prevailing hypotheses for poor stock performance.

$F_{2004-2008} < F_{MSY}$ and $B_{2008} > B_{waypoint}$

If fishing mortality is below F_{MSY} and the stock biomass exceeds the rebuilding waypoint, then the appropriate management advice is to maintain F at or below F_{MSY}. In this situation it is unlikely that F needs to be reduced to F rebuild to meet the 2014 time frame for rebuilt stocks. Revision (upwards) of biomass and especially F targets should be considered, but if biomass targets are revised upwards, they would not apply to the 2014 end point of the original rebuilding program.

$F_{2004-2008} < F_{MSY}$ and $B_{2008} = B_{waypoint}$

If the fishing mortality rate is below the F_{MSY} value but above Frebuild, and the stock is on track, then a re-evaluation of the need to reduce F to F rebuild should be undertaken. If the stock can be rebuilt to the original B_{MSY} fishing at $F_{2002-2008}$, then these rates should be maintained.

$F_{2004-2008} <$ Fmsy and $B_{2008} < B_{waypoint}$

In this condition, there are significant problems with the near-term productivity of the stock likely unrelated to current fishing effects (although there may be ongoing depensatory effects due to historical stock depletion). The lack of recovery of stock biomass may be due to continued below-average recruitment (e.g., due to environmentally-caused regime change) or other single- or multispecies influences on growth, natural mortality, and maturity. In this case, scientists should re-consider biomass and fishing mortality rate targets in light of prevailing hypotheses for poor stock performance.

The adaptive rebuilding trajectory will be used for the following stocks:

GOM cod
GOM haddock
GB haddock
Redfish
SNE/MA winter flounder
Windowpane flounder (south)
Ocean pout

Stock	F_{2002}	F_{MSY} in 2004-2008	$F_{REBUILD}$ (2009, 2003)[1]	Lower[2] 50th CI of SSB_{2008} (K mts)	SSB_{2008} (Projected SSB_{2002}) (K mts)	Upper 50th CI of SSB_{2008} (K mts)	Pr (SSB_{2014} exceeds SSB_{MSY})
Gulf of Maine cod	**0.33**	**0.23**	**0.22**	**46.9**	**53.3 (23.8)**	**60.7**	**0.51**
Georges Bank cod	0.43	0.18	0.18	41.8	50.9 (26.5)	62.2	
Georges Bank haddock	**0.20**	**0.26**	**0.25**	**180.8**	**214.6 (99.6)**	**249.7**	**0.51**
Cape Cod/Gulf of Maine yellowtail flounder	0.68	0.17	0.07	6.9	7.6 (2.5)	8.4	0.51
S. New England/MA yellowtail flounder	0.85	0.26	0.17	21.6	45.4 (2.0)	71.9	0.51
American plaice	0.27	0.17	0.15	20.7	22.6 (15.6)	24.7	0.51
S. New England winter flounder	**0.44**	**0.32**	**0.23**	**12.7**	**14.3 (6.0)**	**16.1**	**0.51**
Acadian redfish	**<0.01**	**0.04**	**0**	**146.8**	**154.9 (130.2)**	**154.3**	**0.06**
Gulf of Maine winter flounder	0.06	0.43	0.43		4.9 (7.7)		0.62

Table 8 - Age-structured projection results for groundfish based on $F_{2003} = F_{2002}$ (interquartile range in parentheses), F_{MSY} in 2004-2008, and $F_{REBUILD(2009,2003)}$ in 2009-2014. Spawning stock biomass in 2008 (SSB_{2008}) and its interquartile confidence interval, SSB_{2002} (in parentheses), and probability that SSB_{2014} exceeds SSB_{MSY} are tabulated for eight Northeast groundfish stocks. Adaptive approach is proposed for stocks in bold-face.

Notes: (1) Frebuild(2009,2003) means the rebuilding F implemented in 2009 that is estimated in 2003

(2) SSB_{2008} and confidence intervals are derived from stock projections estimated in 2003

(3) F2002 estimated based on 2002 landings, provided by NEFSC October, 2003 (unpublished data)

Stock	F 2001	F_{MSY}
Gulf of Maine Haddock	**0.12**	**0.23**
White Hake	1.36	0.55
Windowpane Flounder South	**0.69**	**0.98**
Ocean Pout	**0.007**	**0.31**

Table 9 – Exploitation ratios for adaptive approach for index-based stocks. Adaptive approach is proposed for stocks in bold-face.

	$B_{2008} > B_{waypoint}$	$B_{2008} = B_{waypoint}$	$B_{2008} < B_{waypoint}$
F2004-8 > Fmsy	Effort controls ineffective. Very strong recruitment **OR** High growth **OR** Lowered M and/or discards.	Effort controls ineffective. Strong recruitment may have offset overfishing.	Effort controls ineffective. Average or low recruitment failed to offset overfishing **OR** Growth lower than expected.
F2004-8 = Fmsy	Effort controls effective. Strong (above projected) recruitment.	Effort controls effective. Recruitment at average projected level. No evidence to reject basis for forecasting approach.	Effort controls effective. Below average recruitment led to below average biomass. **OR** Natural or discard mortality increased.
F2004-8 < Fmsy	Effort control more effective than expected. Average to strong recruitment.	Effort controls more effective than expected. Lower than average recruitment may offset lower F	Effort control more effective than expected. Recruitment or growth well below average ***OR*** Natural or discard mortality increased.

Figure 1 – Adaptive management causal factors/hypotheses table

	$B_{2008} > B_{waypoint}$	$B_{2008} = B_{waypoint}$	$B_{2008} < B_{waypoint}$
F2004-8 > Fmsy	Reduce F to Fmsy, re-consider Bmsy, Fmsy Reconsideration should come before reduction in F. Identify causes—strong recruitment offset overfishing? Re-estimate F_{MSY}, B_{MSY} as appropriate	Reduce F to Frebuild Extra measures will be needed since present measures ineffective. Identify causes—strong recruitment offset overfishing? Re-estimate F_{MSY}, B_{MSY} as appropriate	Reduce F to F rebuild; Consider basis for poor biomass performance Extra measures will be needed since present measures ineffective. Consider extending end date for rebuilding
F2004-8 = Fmsy	Maintain F at Fmsy or below Depends on expected trajectory from B'08 to B'14 at Fmsy. Re-estimate F_{MSY}, B_{MSY} as appropriate	Reduce F to Frebuild Proceed with plan. Consider revising F rebuild if value for 2009-2014 greater than previous value Re-estimate F_{MSY}, B_{MSY} as appropriate	Reduce F to Frebuild; **and/or** re-estimate Bmsy, Fmsy as appropriate Consider regime changes, multispecies effects, changes in vital rates Consider extending end date for rebuilding
F2004-8 < Fmsy	Maintain F </= Fmsy, re-consider Bmsy Reconsider time frame for rebuild. No penalty for early victory. Re-evaluate Fmsy (too low?) Re-estimate F_{MSY}, B_{MSY} as appropriate	If F_{2008} will rebuild to Bmsy, maintain F Re-estimate F_{MSY}, B_{MSY} as appropriate	Consider basis, re-estimate Bmsy, Fmsy as appropriate Consider regime changes, multispecies effects, and changes in vital rates Consider extending end date for rebuilding

Figure 2 – Adaptive management action table

3.2.3.1.3 Proposed action

The Council proposes to use a combination of phased and adaptive rebuilding strategies as described below.

The phased reduction strategy will be used for the following stocks:

- GB cod
- American plaice
- CC/GOM yellowtail flounder
- SNE/MA yellowtail flounder
- White hake

As noted in section 3.2.3.1.1, it is difficult to design a management program that precisely mirrors the changes in fishing mortality that are shown in Table 7. In most cases, the proposed measures in section 3.6.1 achieve more of a reduction than is necessary to comply with the phased reduction strategy in the early years of the rebuilding program. In essence, the proposed management measures "jump start" the phased reduction strategy for GB cod and for CC/GOM yellowtail flounder. This was not inadvertent – the Council made a conscious decision to select these measures in order to lower mortality more rapidly than would be required through strict adherence to the phased reduction strategy schedule. For these stocks, the realized fishing mortality rates that the Council plans to achieve are more restrictive than those shown in the phased strategy. For this reason, the Council modified the phased strategy from the theoretical values shown in Table 7 to take into account the impacts of the proposed management measures, the schedule for assessment updates, and the practical difficulties of making constant adjustments to management measures.

An adaptive rebuilding strategy (as described in section 3.2.3.1.2) will be used for the following stocks:

- GOM cod
- GOM haddock
- GB haddock
- Redfish
- SNE/MA winter flounder
- Windowpane flounder (south)
- Ocean pout

The fishing mortality rate schedule that will result from combining these two approaches is shown in Table 10 below. This table will be used to evaluate the success of the formal rebuilding programs, and to guide future management decisions (unless changed by a later action). It should be noted that this table has been updated to reflect current estimates of the fishing mortality in 2002 and 2003 (developed October, 2003 by the NEFSC). These rates are slightly different than those used to develop the rebuilding trajectories in the draft amendment (as shown in Table 7 and Table 8). In addition to the fishing mortality rates, for each stock the target TACs are shown for calendar years 2004, 2005, and 2006 in Table 11. Projection models calculate catch or landings based on calendar years, not fishing years. If stocks are changing in size, this difference can lead to a misinterpretation of landings information. If a stock is declining, using a TAC based on a calendar year will over-estimate the TAC for the fishing year. The opposite is true if a stock is growing. One way to adjust for this is to use the average target TAC for two calendar years as the target TAC for the fishing year. These averages can be calculated from the information shown. These target TACs do not include any recommendations resulting from implementation of the US/CA Resource Sharing Understanding.

For ocean pout, the target mortality from 2004 through 2008 will be significantly less than F_{MSY}, but is still three times higher than the estimated exploitation in calendar year 2002. The analytic techniques used to estimate the rebuilding trajectory for this stock are not the same as the techniques used to estimate F_{MSY}. NEFSC 2002a attempted to re-estimate the F_{MSY} value for ocean pout using index based techniques, but found the results uninformative.

Adjustments to management measures will be needed to ensure that rebuilding program fishing mortality rates are met. An adjustment may be needed in fishing year 2006 to reduce mortality on plaice and SNE/MA yellowtail flounder, and a second adjustment may be needed in 2009 to reduce mortality on several stocks. Finally, additional measures may be needed after 2010 to reduce mortality for CC/GOM yellowtail flounder. An update assessment is planned for 2005, which will provide information necessary to adjust the measures for 2006. A benchmark assessment of the complex, including a review of status determination criteria, will be conducted in 2008. Default measures are included in section 3.6.1 that are designed to meet the appropriate fishing mortality rates through 2009.

SPECIES	STOCK	Assumed F2002/2003	Fishing mortality rates for proposed rebuilding program									
			2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Cod	***GB***	***0.43***	***0.21***	***0.21***	***0.21***	***0.21***	***0.21***	***0.18***	***0.18***	***0.18***	***0.18***	***0.18***
	(add ten years)		***0.18***	***0.18***	***0.18***	***0.18***	***0.18***	***0.18***	***0.18***	***0.18***	***0.18***	***0.18***
	GOM	0.33	0.23	0.23	0.23	0.23	0.23	0.21	0.21	0.21	0.21	0.21
Haddock	GB	0.20	0.26	0.26	0.26	0.26	0.26	0.24	0.24	0.24	0.24	0.24
	GOM		0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.22
Yellowtail Flounder	GB	0.15	No formal rebuilding program required									
	SNE/MA	***0.85***	***0.37***	***0.37***	***0.26***	***0.26***	***0.26***	***0.17***	***0.17***	***0.17***	***0.17***	***0.17***
	CC/GOM	***0.68***	***0.26***	***0.26***	***0.26***	***0.26***	***0.26***	***0.17***	***0.17***	***0.17***	***0.13***	***0.13***
	(add ten years)		***0.13***	***0.09***	***0.09***	***0.09***	***0.09***	***0.09***	***0.09***	***0.09***	***0.09***	***0.09***
American Plaice		***0.27***	***0.23***	***0.23***	***0.17***	***0.17***	***0.17***	***0.15***	***0.15***	***0.15***	***0.15***	***0.15***
Witch Flounder		0.41	No formal rebuilding program required (see overfishing discussion)									
Winter Flounder	GB	0.10	No formal rebuilding program required									
	GOM	0.10	No formal rebuilding program required									
	SNE/MA	0.45	0.32	0.32	0.32	0.32	0.32	0.23	0.23	0.23	0.23	0.23
Redfish		<0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
White Hake		***0.55 (C/I)***	***1.03***	***1.03***	***1.03***	***1.03***	***1.03***	***0.23***	***0.23***	***0.23***	***0.23***	***0.23***
Pollock		3.30 (C/I)	No formal rebuilding program required									
Windowpane Flounder	North	0.09(C/I)	No formal rebuilding program required									
	South	0.50(C/I)	0.98	0.98	0.98	0.98	0.98	0.49	0.49	0.49	0.49	0.49
Ocean Pout(1)		0.01(C/I)	0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01
Atlantic Halibut	Insufficient information to calculate rebuilding mortality											

Table 10 – Proposed rebuilding trajectories. Stocks using a phased approach in *bold italics*.

(1) Ocean pout F_{MSY} estimated as 0.31 in Applegate et al. (1999), not re-estimated in NEFSC 2002a.

SPECIES	STOCK	2004	2005	2006	Composition
Cod	GB	3,949	4,830	6,361	US, CA landings
	GOM	4,850	6,372	7,470	Comm. landings, discards, rec. harvest
Haddock	GB	24,855	27,692	31,866	US, CA landings
	GOM	4,831	4,735	4,642	Comm. landings
Yellowtail Flounder	GB	11,713	11,341	11,599	US, CA landings and discards
	SNE/MA	707	1,982	3,325	Comm. landings and discards
	CC/GOM	881	1,233	1,034	Comm. landings and discards
American Plaice		3,695	3,625	3,015	Comm. landings and discards
Witch Flounder		5,174	6,992	7,667	Comm. landings
Winter Flounder	GB	3,000	3,000	3,000	Comm. landings
	GOM	3,286	2,634	2,205	Comm. landings, discards, rec. harvest
	SNE/MA	2,860	3,550	4,445	Comm. landings, discards, rec. harvest
Redfish		1,632	1,725	1,803	Comm. landings
White Hake		3,839	3,822	3,805	Comm. landings (all sizes)
Pollock		10,584	10,584	10,584	Comm. landings
Windowpane Flounder	North	534	534	534	Comm. landings
	South	285	273	262	Comm. landings
Ocean Pout		77	77	77	Comm. landings
Atlantic halibut		NA	NA	NA	NA

Table 11 – Calendar year target TACs (mt) estimated in 2003 (Source: NEFSC, unpublished data)

3.3 Ending Overfishing

The M-S Act also requires the Council to submit a management plan that will end overfishing where it is occurring. The measures in this amendment that are designed to rebuild overfished stocks are also designed to end overfishing. Some stocks are both overfished and overfishing is occurring – formal rebuilding programs for these stocks will also end overfishing. Based on stock status as described in section 9.2.1.1, the following table lists those stocks where overfishing is occurring whether or not they are overfished. This table uses the definition of overfishing applied by NMFS and proposed by the Council – that is, a fishing mortality rate that exceeds the maximum fishing mortality threshold. Fishing mortality in 2001 is compared to the F_{MSY} shown earlier to make this determination. Projected fishing mortality in calendar year 2002 is also shown.

Stock	F2001	F2002 (Projected)	FMSY
Gulf of Maine Cod	0.47	0.33	0.23
Georges Bank Cod	0.38	0.43	0.18
Cape Cod/GOM Yellowtail Flounder	0.75	0.68	0.17
Southern New England/Mid-Atlantic Yellowtail Flounder	0.91	0.85	0.26
Southern New England/Mid-Atlantic Winter Flounder	0.51	0.44	0.32
American Plaice	0.43	0.27	0.17 (F40%)
Witch Flounder	0.76 (SAW 37)	0.41 (SAW 37)	0.23 (F40%)
White Hake	1.36 (C/I)	0.91 (C/I)	0.55 (C/I)
Atlantic Halibut	unknown	unknown	0.06

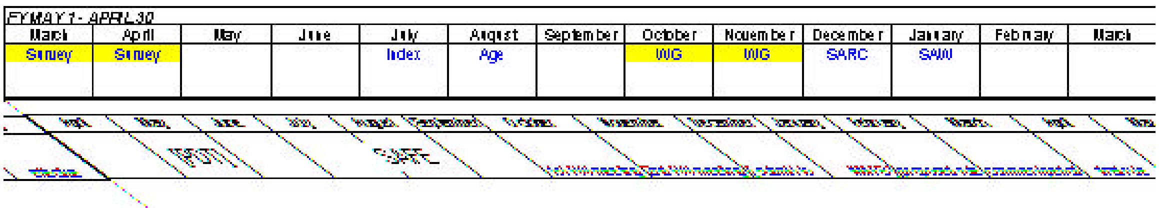
Table 12 – Stocks where overfishing is occurring. (Source: GARM 2002. Projected 2002 F estimates provided by NEFSC, unpublished data, except for witch flounder)

3.4 Fishery Program Administration

Since Amendment 7, a number of issues surfaced that primarily relate to the administration of the groundfish fishery, though some of these issues may also have biological, social, or economic impacts.

3.4.1 Fishing Year

There is no change to the groundfish fishing year, which will continue to be defined as the period May1 – April 30.



Rationale: The current start of the fishing year is May 1. The Council is retaining this date since it has been used since Amendment 5, is familiar to the fishery, and any chance would cause additional disruption to an industry that will be subject to a drastic change in regulations through this amendment. Retaining the current fishing year will not create an administrative burden or require any additional alterations to the incorporation of scientific and fishery data into management analyses. All annual adjustments would continue to be implemented on May 1. However, a recent legal action dictated that proposed rulemaking may be required as a part of the framework adjustment process. This extends the time from submission of the Council-approved framework to its implementation by approximately 2.5 months. As a result, the previous schedule for incorporation of current scientific information into management which was based on a May 1 fishing year will not longer be applicable to the process when a proposed and final rule must be published.

The schedule outlined above demonstrates one disadvantage to maintaining a May 1-April 30 fishing year. Proposed rulemaking extends the gap from availability of data required for development of the framework to implementation of the framework. With this schedule, there are 25 months between the last month of the spring survey and the start of the fishing year, when framework measures take effect.

3.4.2 Periodic Adjustment Process

3.4.2.1 Revision of the Multispecies Monitoring Committee/Plan Development Team

The Multispecies Monitoring Committee (MSMC) will be folded into the Plan Development Team (PDT) and cease to exist as a separate committee. As a result, PDT membership will be revised to include technical staff from the New England Fishery Management Council, the NMFS Northeast Regional Office, the Northeast Fisheries Science Center (biologists, social scientists, and economists), technical personnel from state management agencies or qualified researchers, a representative from the United States Coast Guard, the chair of the groundfish advisory panel, and another interested party designated by the Council chair. The PDT will continue to provide technical support to the groundfish committee in the development of fishery management plans and amendments. In addition, it will monitor the current plan and develop options for framework adjustments through a periodic adjustment process, described below.

Rationale: There are several reasons for consolidating the PDT and MSMC into a single group. First, there is already significant overlap in the current membership of the groups. Nearly all PDT members also participate on the MSMC. Additionally, reducing the number of separate committees may simplify and streamline the adjustment process. In general, the current management system would benefit from a simplified approach. One disadvantage to consolidating these groups is that the MSMC is currently perceived as a more external, objective body than the PDT.

3.4.2.2 Biennial adjustment (every two years)

The PDT will prepare a SAFE report each year. The annual adjustment process implemented by Amendment 7, however, will be revised to a biennial adjustment, with the PDT performing a review and submitting management recommendations to the Council every two years. This annual review should be completed by the PDT based on the most current scientific information provided primarily by the Northeast Fisheries Science Center. The PDT may also consider data provided by the states, ASMFC, the USCG and other sources. This proposed schedule does not prevent the Council from taking action at another time.

The biennial adjustment process may be modified during the initial years after the amendment. An updated groundfish assessment is scheduled for 2005, which will facilitate a biennial adjustment (if necessary) that would take effect in the 2006 fishing year. This matches the proposed biennial adjustment. Benchmark assessments, including a review of status determination criteria, are planned for 2008. This will facilitate an adjustment that will take effect in fishing year 2009, one year later than the normal biennial adjustment process.

The schedule outlined in section 3.4.1 (Fishing Year) and repeated below describes the framework adjustment process for the proposed action in Amendment 13. The schedule, as shown, provides enough time for a framework action that requires a proposed and final rule. If the action proposed is narrow enough in scope and impacts to not require a final rule, than the framework meetings can be held at a later date. According to current regulations, if the Council fails to submit measures by February 1, the Regional Administrator is authorized to choose any PDT alternatives not specifically rejected by the Council.

By September 1 of the adjustment year the PDT will report new measures to the Council for their consideration that would appropriately address current management needs in the multispecies plan (within the scope of a framework). The PDT will review the most current data pertaining to landings, stock status and fishing mortality rates, enforcement issues, DAS use, social and economic impacts, and any other relevant information. The Council should hold its first framework meeting in September to review the PDT options. The second framework meeting will be held in October or November. This schedule is necessary if the action must go to a proposed rule; if it is of a limited scope that does not require a proposed rule, the submission could be slightly delayed.

Between November 1 and December 1, the Council will submit recommendations to the Regional Administrator. The Regional Administrator will review the Council's recommendations, including the supporting analysis, and publish the appropriate proposed or final rule within 30 days of the Council's submission.

FY MAY 1 - APRIL 30

March	April	May	June	July	August	September	October	November	December	January	February	March
Survey	Survey			Index	Age		WG	WG	SARC	SAW		

April	May	June	July	August	September	October	November	December	January	February	March	April	May
	[PDT]			SAFE		1st FW meeting	2nd FW meeting	[submit to	NMFS]	proposed rule	comment period	final rule	effective

Discussion: The resource must be allowed some time to respond biologically to changes in management. Extending the duration of time between each periodic review and adjustment of the multispecies FMP would allow such measures to take effect on the stock, enabling the PDT to more accurately evaluate their performance in helping to achieve mortality and biomass targets for the managed stocks.

In addition, more time between each review of the plan means that there will be more current scientific information available upon which to base the evaluation. Furthermore, changing the review and adjustment schedule from an annual to a biennial process will free time and resources for managers, administrators and other participants. Performing an annual adjustment would place a significant burden on technical and administrative staff of the NEFMC, NMFS and NEFSC. The biennial adjustment process is more feasible and allows more flexibility in the utilization of time and resources of individuals and administrations.

3.4.2.3 List of Frameworkable Items

Many management measures can be adjusted through a framework action. In addition to those measures that are currently identified in the regulations, the following measures can be adjusted in the future:

- Revisions to status determination criteria, including, but not limited to, changes in the target fishing mortality, minimum biomass threshold, numerical estimates of parameter values, use of a proxy for biomass, etc.
- DAS allocations (such as the category of DAS under the DAS reserve program, etc.), DAS "baselines", etc.
- Additional uses for Category B DAS (including uses not part of a Special Access Program), and future uses for Category C DAS
- Modifications to capacity alternatives, such as changes to any conservation taxes, changes to any DAS leasing provisions, or DAS transfer provisions, etc.
- Area management boundaries, calculation of area management TACs, or other details of the area management program, including adoption of area-specific management measures
- Sector allocation requirements and specifications, including establishment of a new sector, adopting the GB cod gillnet sector, or changing the allowable maximum TAC available to a sector through the sector allocation program
- Measures to implement the US/CA resource sharing understanding, including any specified TACs (hard or target)
- Changes to administrative measures
- Changes to reporting requirements
- Changes to the handgear only permit category
- Gear requirements or gear changes in order to improve selectivity, reduce bycatch, and reduce impacts on essential fish habitat
- Gulf of Maine Inshore Conservation and Management Stewardship Plan
- Adjustments for steaming time
- Changes to special access programs, including the implementation of additional Special Access Programs
- Other management measures adopted through this management plan

3.4.3 United States/Canada Resource Sharing Understanding

Several stocks on Georges Bank are transboundary and require coordinated actions between the US and Canada to effectively manage these resources. Since 1984 when the international maritime boundary line between the United States and Canadian federal waters was drawn, the two countries have worked together more effectively to manage and enforce fishery management programs. In 1998 the Transboundary Resource Assessment Committee (TRAC) was formed to coordinate stock evaluations of transboundary resources, and to combine all available scientific information between the two nations. Soon after, the Transboundary Management Guidance Committee (TMGC) was created to develop a management advisory process. After several meetings, in December 2001 the TMGC agreed to a final compromise for how several transboundary stocks should be allocated between the two nations. This resource sharing understanding does *not* connote a formal international agreement or memorandum of understanding. However, it is expected that groundfish regulations in both nations will satisfy the terms specified in this informal agreement.

The NEFMC reviewed this understanding and voted to incorporate the US/Canada Sharing Agreement into Amendment 13 at the July 2002 Council meeting. Canada incorporated the agreement into its management of Georges Bank stocks for 2003. Management of Georges Bank cod, haddock and yellowtail flounder will be subject to the terms set forth in the United States/Canada resource sharing agreement. The actual agreement text is included in Appendix III. Primary provisions of this agreement are:

- The agreement specifies an allocation of Georges Bank cod, haddock, and yellowtail flounder for each country. This allocation is based on a formula, which includes historical catch percentage and present resource distribution. (The specific formula is described in detail in the sharing agreement in Appendix III. For GB cod and haddock, only the portions of the stock in statistical areas 5Zjm/561 and 562 are subject to the agreement. The entire stock area for GB yellowtail flounder is covered by the understanding. The U.S. portions of these stock areas are shown in Figure 3).
- Catches by U.S. vessels from these management units will not exceed the appropriate allocation. If a species allocation is reached during the course of the fishing year in the United States, the TAC for the following year will be reduced by the same amount.

This section describes measures proposed to implement the understanding.

3.4.3.1 Management Bodies

In addition to the Council, there are two other organizations involved in administering the understanding:

U.S./Canada Steering Committee: NMFS and Canadian DFO committee that has overall responsibility for the understanding.

Trans-Boundary Management Guidance Committee (TMGC): U.S. and Canadian committee that provides non-binding guidance to the Steering Committee. Each country's delegation consists of six members: one manager, one scientist, and four industry representatives. The U.S. delegation is appointed by the NERO RA after consultation with the Council. The TMGC is not a Council committee and does not hold public meetings or provide public notice of its meetings.

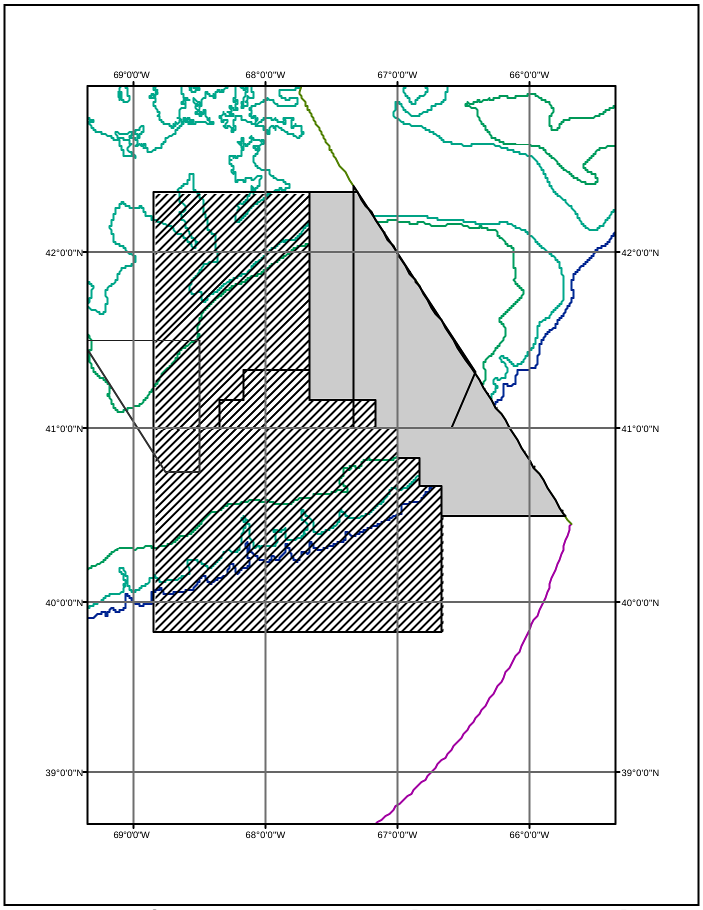


Figure 3 – Area for US/CA Resources Sharing Understanding. Shaded area applies for eastern GB cod and haddock, shaded and cross-hatched area applies for GB yellowtail flounder.

3.4.3.2 Determining and Implementing Annual Harvest Levels

Annual harvest levels and recommended management measures for the management units are determined by a process that involves the Council, the TMGC, and the Steering Committee. See the following flowchart (Figure 4) for an outline of the process to set harvest levels and adopt management measures. Specific details for determining harvest shares are described in Appendices II and III. Note that for the U.S. fishery, all harvest levels and any measures must be approved and submitted by the Council before implementation. This provides opportunity for public comment. If the Council or GOMAC disagree with TMGC recommendations, they will be referred back to the TMGC for further refinement.

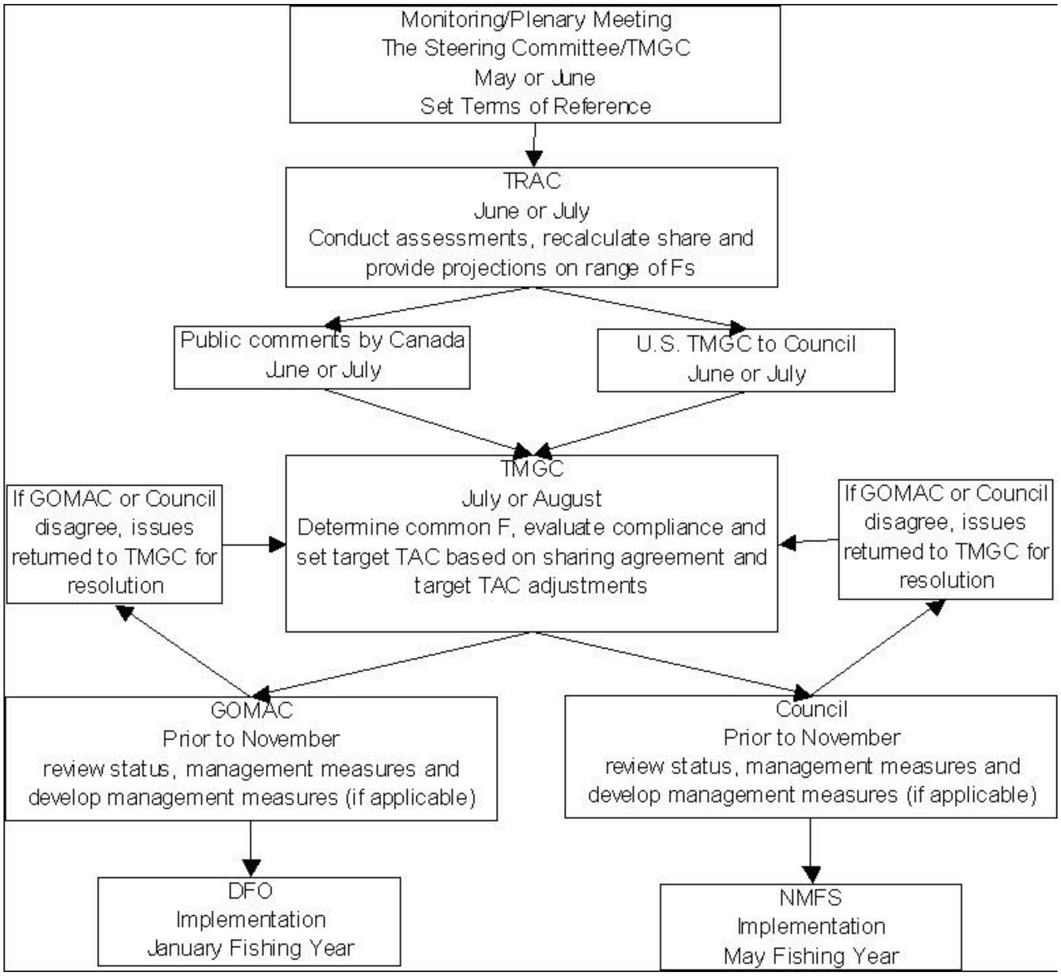


Figure 4– Process for adopting TACs and measures implementing US/CA resource sharing understanding.

3.4.3.3 Proposed Measures

The proposed measures apply to fisheries that impact cod or haddock in statistical areas 551, 552, 561 and 562 (Canadian unit areas 5Zj and 5Zm) and yellowtail flounder in statistical areas 551, 552, 561, 562, 522 and 525 (Canadian unit area 5Zh, 5Zj, 5Zm, 5Zn) and are hereafter referred to as the agreement management units. The management objective for the shared cod, haddock and yellowtail flounder resource is to achieve but not exceed the US allocation fraction as allocated through the US/CA Sharing Agreement.

3.4.3.3.1 Generic Measures

3.4.3.3.1.1 Other fisheries

The understanding does not affect other (non-groundfish) fisheries, but the catch of cod, haddock, and yellowtail flounder in the agreement management units are counted against the TAC regardless of gear type. Existing exempted/certified bycatch fishery and exempted gear provisions continue. A partial list of exempted fisheries/gear that may take place in this area:

- Lobster pots
- Herring (trawl and purse seine)
- Red Crab
- Pelagic longline

- Tuna purse seine and other pelagic tuna gear
- Hagfish
- Swordfish harpoon
- (Scallop gear, while technically not exempted gear or an exempted fishery, is authorized in the area subject to other regulations)
- (Recreational groundfish fishing, while technically not exempted gear or an exempted fishery, is authorized in the area subject to other regulations)

3.4.3.3.1.2 Identification of participants:

Vessels fishing on a groundfish DAS in the agreement area (statistical areas 551, 552, 561, 562, 522 and 525) must use VMS. A vessel must declare (using VMS code) at the start of a trip. On a given trip, a vessel can only fish either inside the US/CA area, or outside the US/CA area (no combined trips).

3.4.3.3.1.3 Reporting requirements:

Vessels making trips in the area required to report using Interactive Voice Reporting (IVR) system at the end of each trip in the area, unless or until a catch reporting system is available through VMS.

3.4.3.3.1.4 Observer coverage

The same level of observer coverage as implemented elsewhere (e.g. if coverage of 10% of total DAS is implemented, 10% of DAS in this area must have observer coverage) will be required in the agreement area. The observer coverage must also meet or exceed the TMGC specified targets.

3.4.3.3.1.5 Dockside scientific sampling

Catch sampling by NMFS port agents must be adequate to characterize catch-at-age from this area.

3.4.3.3.1.6 Industry input on revisions to measures

Industry input on revisions to management measures in the area will be solicited through the Groundfish Advisory panel (supplemented if necessary with additional personnel) and the Groundfish Oversight Committee.

3.4.3.3.1.7 Gear requirements

May be modified to achieve but not exceed the statistical area 561 and 562 (5Zjm) haddock and cod stocks and the GB yellowtail flounder TACs.

3.4.3.3.1.8 Incentives

It is important for the U.S. to harvest available cod, haddock, and yellowtail from the management units. Because of other restrictions contemplated for this action, there may be a need for incentives to fish on these offshore stocks. One specific incentive program is described as a Special Access Program in section 3.4.5.3.3. Possible additional incentives to fish in the 5Zjm area:

- DAS adjustments
- Credits for steaming time (implemented on adoption of Amendment 13) to statistical areas 561 and 562 (Canadian areas 5zjm)
- Higher trip limits

Upon implementation of the Amendment, vessels will not be charged for steaming time to and from statistical areas 561 and 562 (Canadian areas 5zjm).

3.4.3.3.1.9 Other restrictions

The Council may consider limiting the number of trips in the area for each vessel, for example to address following concerns:

- Provide opportunities for vessels of all sizes to access area
- Address market concerns
- Extend TAC
- Reduce risk of discards during specific seasons

3.4.3.3.1.10 Special access programs

Can be implemented through process proposed in section 3.4.5.

3.4.3.3.1.11 Changes to Measures

Measures remain in place until altered (i.e. no requirement for annual changes). If changes to measures are warranted, the following may be modified through a notice action published in the Federal Register:

Periodic adjustments: In consultation with the Council, the RA may adjust gear requirements, modify access to fishing areas within the agreement management units, and trip limits to meet established TACs as specific in the sharing agreement.
In season adjustments: At 30% and 60% of the total specified TAC for each species harvested from the agreement management units, the RA may adjust the gear requirements, modify access to the agreement management units, trip limits, and number of trips to meet established TACs as specific in the sharing agreement.

The RA, in consultation with the Council, can withdraw from provisions of understanding if deemed inconsistent with M-S Act or other applicable law, or with goals and objectives of groundfish FMP. After consultation with Council, RA will contact DFO representatives to address time critical issues that arise outside of normal review schedule.

3.4.3.3.2 Harvest Controls

Since the sharing agreement is based on a target catch determined by a common fishing mortality strategy, it is important to note that the choice of mortality reference points for the respective cod, haddock and yellowtail flounder stocks is critical. The US and Canada must set consistent mortality targets. If the US and Canada set mortality targets that are substantially different there will likely be difficulties in agreeing to the initial TACs.

3.4.3.3.2.1 Hard TAC

- Stock specific TACs (561 and 562 (5Zjm) cod and haddock; and 522, 525, 561, 562 (5Zhjmn) yellowtail flounder)
  Implement conservative measures up front to preserve the cod TAC in order to allow a directed haddock and yellowtail flounder fishery:
  - In consultation with the Council, the RA may adjust gear requirements, modify access to fishing areas within the agreement management units, and trip limits to meet established TACs.
  - Special access program rules that allow fishing for yellowtail flounder with no bycatch of cod. These programs may modify or change gear requirements.
  - Flat fish net or separator trawl gear (see definitions below)
  - Cod trip limit of 5% of total catch not to exceed 500 pounds per DAS, 5,000 pounds per trip

- When 70 percent of the target species (cod, haddock, or yellowtail flounder) is projected to be caught and catch rates indicate the TAC will be caught before the end of the year, the following restrictive trip limits go into place:
    - Haddock: 1,500 lbs/day, 15,000 lbs per trip
    - Yellowtail flounder: 1,500 lbs/day, 15,000 lbs per trip
- When 100 percent of the TAC is projected to be caught, the area (statistical areas 5zjm) will be closed to all fishing on a groundfish DAS that may take cod, haddock, or yellowtail flounder, unless an approved special access program allows some fishing in the area to target a specific species. If the GB yellowtail flounder TAC is caught, possession of yellowtail flounder will also be prohibited in statistical areas 522 and 525.

A flounder net is defined as a two-seam low-rise groundfish net.
A haddock separator trawl is defined as a groundfish trawl modified to a vertically-oriented trouser trawl configuration, with two codends arranged one above the other. The bottom cod end is left open. A horizontally oriented large mesh (6 ½ inch square mesh minimum) separating panel is installed between the selvedges joining the upper and lower panels, extending from the front of the trouser junction forwards to the aft section of the first belly behind the fishing circle.
Flounder and haddock separator trawl net specifications may be altered by the Regional Administrator.

3.4.4 Administration of Certified Bycatch/Exempted Fisheries

The standards for certification of a bycatch/exempted fishery that were implemented through Amendment 7 will continue to be used with the following changes.

- The Amendment 7 standard is that fishing only be allowed in a fishery where it can be certified that the incidental catch of regulated multispecies is less than five percent of the total catch, by weight 950 CFR 648.80(a)(8)). This incidental catch standard can be modified by the Council or Regional Administrator in future actions for those stocks that are not in an overfished condition, or if overfishing is not occurring on a stock. When considering modification of the standard, it must be shown that the change will not delay a rebuilding program, nor will it result in an overfished or overfishing condition. The standard can be modified either through a Council action (framework or adjustment) that changes the standard for all fisheries or on a case by case basis. For example, the standard could be revised to say that the incidental catch of regulated species is less than ten percent of the total catch, by weight. Or, to be more specific, the standard could require that the incidental catch of regulated species, not including a rebuilt stock with a low fishing mortality, is less than ten percent of the total catch.
- Other factors will also be considered in the review of a certified bycatch/exempted fishery, such as the impact of the fishery on juvenile fish, sacrifices in yield that will result from that mortality, the ratio of target species to regulated species, status of stock rebuilding, recent recruitment of groundfish species, etc.
- On a case by case basis, a certified bycatch/exempted fishery may be authorized to retain and land regulated multispecies. In making this determination, the Council or the Regional Administrator should consider the status of the stock or stocks caught in the proposed fishery, the risk that allowing this practice will result in a targeted groundfish fishery, the extent of the proposed fishery in terms of time and area, the possibility of expansion in the proposed fishery, the extent of exemption will not be allowed for any bycatch/exempted fishery that takes place in a groundfish closed area, for any stock that is overfished, or if overfishing is occurring on a stock caught by the certified bycatch/exempted fishery. It may be allowed on a stock under a rebuilding program, but only if it can be determined that the catch of the stock in the bycatch/exempted fishery is not likely to result in exceeding the rebuilding mortality rate.

Rationale: These alternatives provide increased flexibility to the Council and NMFS to administer the exempted fisheries program as stocks rebuild.

3.4.5 Special Access Programs

3.4.5.1 Introduction

Because management measures are generally applied over a wide geographic area and a number of sectors of the fishing industry, the management measures designed to reduce fishing mortality on groundfish stocks that are overfished are likely to also reduce mortality or inhibit fishing on groundfish stocks that could support an increase in mortality and landings. In the case of groundfish stocks, this unnecessarily sacrifices yield from these stocks and limits the ability of fishermen to mitigate adverse economic and social impacts of effort reductions by targeting stocks that are in good condition.

Similarly, the multispecies management measures may prevent fishing on stocks in other fisheries. For example, the restrictions associated with the year-round closure areas of the multispecies FMP (closed area I, closed area II, and Nantucket Lightship closed area) prevent access to non-groundfish resources such as Atlantic sea scallops. Such restrictions reduce the management options for other fisheries and may prevent those fisheries from harvesting the optimal level of the resource. For the purposes of the following discussion, the term "stocks of concern" will refer to a regulated multispecies stock that must have fishing mortality reduced, either to comply with a formal rebuilding program, because overfishing is occurring, or to rebuild to the biomass level associated with maximum sustainable yield. Stocks harvested in other fisheries will be referred to as non-groundfish stocks.

In order to facilitate access to groundfish stocks that can support an increase in mortality and to facilitate management of, and access to non-groundfish stocks, the Council proposes to establish a Special Access Program (SAP) process. A Special Access Program is the regulatory mechanism by which fishers could be provided access to limited, specific regulated multispecies or other fisheries that would otherwise be prohibited. The premise for development is that specific fisheries can be developed that do not undermine achievement of the goals of the multispecies FMP. It is important to note that although such a program would have some similarities with the exemption program developed by Amendment 7, it would be fundamentally different. The current exemption regulations as described in 50 CFR 648.80 define a system for approving fisheries that do not target regulated species, and have a limited (less than 5 percent by weight) catch of regulated multispecies. A SAP authorizes fishing for either regulated groundfish or target species in other fisheries, without compromising efforts to rebuild overfished stocks or end overfishing of regulated multispecies. Incentives may be provided to the users of these gear or techniques to encourage participation and move effort off of stocks of concern. A special access program represents a narrowly defined fishery that is prosecuted in such a way as to avoid or minimize impacts on stocks of concern (as well as minimize bycatch and impact on essential fish habitat). Examples of gear or techniques that may be utilized in such a fishery in order to be eligible for a SAP include but not limited to:

- Use of a gear design (net mesh, excluder device, sorting panel, etc.) that avoids or significantly reduces the catch of a stock of concern
- Fishing at a time or season, or in an area, that avoids or significantly reduces the catch of a stock of concern.
- Fishing in an area or with a method that minimizes, to the extent practicable, the adverse effects of fishing on essential fish habitat

This Special Access program alternative is designed to create a process and define minimum criteria that would be utilized in the future to standardize the development and implementation special access programs. A secondary goal of this alternative is to expedite the development of special access programs (through standardization and definition of a process). This management option contains two sub-options, one that defines a process and standards for special access programs for the multispecies fishery and a second sub-option that defines a process and standards for special access programs for other non-groundfish fisheries. Adoption of this program does not change the status of any exempted gears or exempted/certified bycatch fisheries, and does not change or eliminate the exempted fishery process.

3.4.5.2 Special Access Program for Vessels Targeting Groundfish

Under most Amendment 13 alternatives, the primary incentive for a groundfish vessel to enter a SAP will be an adjustment to the DAS. This could be through differential DAS counting (counting DAS at a slower rate) or allocating additional DAS to a vessel. Other incentives may be possible depending on the specific program – for example, allowing regulated access to an area closed to reduce groundfish mortality or protect habitat.

Similar to the exempted fishery program, there are two routes for approval of a SAP. In both cases, the assumption is that there is sufficient information available to support the claim that the SAP will not adversely impact efforts to control mortality on stocks of concern, would, to the extent practicable, minimize bycatch of all non-target species, and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch, and minimize, to the extent practicable, adverse effects on EFH caused by fishing. If that information is not available, the first step in getting authorization will be to demonstrate the feasibility of the SAP through an experimental fishery.

A SAP can be implemented by:

1. Submission and approval of a management action (framework adjustment or plan amendment) by the New England Fishery Management Council. SAPs implemented through this approach will follow the usual rulemaking procedures (including, if applicable, abbreviated rulemaking under a framework action).

2. Submission of a proposed SAP by an industry participant or other member of the public, followed by review and approval by the Regional Administrator (RA), in consultation with the Council. This approach is designed to more rapidly implement a SAP than the formal management action approach. For this to be possible, the impacts of the SAP must fall within the range of the impacts analyzed by the appropriate NEPA analytical document accompanying Amendment 13 or other management action. In order to be approved by the RA, a SAP submitted through this approach must meet the following criteria:

> (a) The SAP must target a groundfish stock or stocks in which the previous year's catch fell short of the target or hard TAC. The proposed SAP application must also demonstrate that it will not catch more than the previous year's shortfall and the SAP will not result in overfishing of any stock, or cause any stock to become overfished. These elements ensure that the biological impacts for the target stock will fall within the range of the biological and economic impacts analyzed in the Amendment (economic impact analyses will include the assumption that all stocks are caught at their target levels). In order to demonstrate consistency with the goals of the FMP, the application shall specify the number of vessels, how such vessels are to be selected, and the estimated catch rate of the target and bycatch species.
> (b) The proposed SAP cannot adjust or change any of the measures that minimize, to the extent practicable, the adverse impacts of fishing activity on habitat. This limitation increases the likelihood that any habitat impacts of the SAP will fall within the range of the impacts analyzed in the FSEIS.
> (c) The proposed SAP must not increase fishing mortality on a stock of concern. This limitation increases the likelihood that the biological impacts of the SAP will fall within the range of the impacts analyzed in the FSEIS for stocks of concern. This can be accomplished in several ways:
>
> > (1) By adoption of a limitation on catch of the stock of concern, for example through a special TAC for the SAP, adequately monitored through sufficient observer coverage. (2) By adopting gear or fishing techniques previously demonstrated to reduce or avoid the catch of stocks of concern. In the case of a reduction, it must be shown that the reduction is sufficient that any increase in time fishing (effort) (through additional DAS allocations or differential DAS counting) will not increase the catch of a stock of concern beyond that which would result if the program were not approved.

(3) By a sufficient overall effort (fishing time) reduction or redirection such that there is no net increase in bycatch mortality.

(d) The SAP shall occur within a defined area.
(e) Participation in the SAP cannot be limited to vessels from a particular state or political subdivision. This reduces the likelihood the SAP will be considered an allocation of resources to a particular community.
(f) To the extent practicable, the SAP must reduce discards and/or discard mortality of all species.
(g) The proposed SAP shall not have significant impacts (as defined by NEPA), or, if significant, that these impacts were analyzed in the FSEIS for Amendment 13 or later management action.
(h) The proposed SAP shall specify the type of data reporting to be utilized to monitor the status of harvest and should include a realistic plan of implementation.
(i) The RA must make a finding that adherence to the prescribed conditions can be assured in light of available enforcement resources and in light of the enforcement record of vessel owners and operators of the vessels.

If a SAP request is submitted to the RA for approval in the process described in (2), the RA will:

- Perform an initial cursory review to insure the required elements are present.
- If all required elements are present, notify the Council of receipt of the SAP proposal within 21 days of receipt of the application.
- Publish a notice in the Federal Register requesting comment on the SAP proposal within a 30-day comment period.
- After considering comments from the Council and the public, make a determination on the proposed SAP and issue a permit authorization or regulations, as appropriate, within 60 days of the end of the comment period.

3.4.5.3 Special Access Program for Vessels Targeting Other Fisheries

There are two routes for approval of a SAP. In both cases, the assumption is that there is sufficient information available to support the claim that the SAP will not adversely impact efforts to control fishing mortality on stocks of concern, would, to the extent practicable, minimize bycatch of all non-target species, and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch, and minimize, to the extent practicable, adverse effects on EFH caused by fishing. If that information is not available, the first step in getting authorization will be to demonstrate the feasibility of the SAP through an experimental fishery.

A SAP can be implemented by:

1. Submission and approval of a management action (framework adjustment or plan amendment) under the FMP that manages the target species by the New England Fishery Management Council. In this instance, documents submitted by the Council will ~~clearly~~ demonstrate the SAP will not adversely impact stocks of concern and will not result in identifying any groundfish stock as overfished or subject to overfishing. The action will also analyze the impacts of the proposal and demonstrate compliance with all applicable law. SAPs implemented through this approach will follow the usual rulemaking procedures (including, if applicable, abbreviated rulemaking under a framework action).

2. Submission of a proposed SAP by an industry participant or other member of the public, followed by review and approval by the Regional Administrator (RA), in consultation with the Council. This approach is designed to more rapidly implement a SAP than the formal management action approach. For this to be possible, the impacts of the SAP must fall within the range of the impacts analyzed by the appropriate NEPA analytical document accompanying Amendment 13 or other management action. In order to be approved by the RA, a SAP submitted through this approach must meet the following criteria:

(a) In order to demonstrate consistency with the goals of the FMP, the proposed SAP must specify the number of vessels, how such vessels are to be selected, and the estimated catch rate of the target and bycatch species.
(b) The proposed SAP cannot adjust or change any of the measures that minimize, to the extent practicable, the adverse impacts of fishing activity on habitat. This limitation increases the likelihood that any habitat impacts of the SAP will fall within the range of the impacts analyzed in the FSEIS.
(c) The proposed SAP must not increase fishing mortality on a stock of concern. This limitation increases the likelihood that the biological impacts of the SAP will fall within the range of the impacts analyzed in the FSEIS for stocks of concern. This can be accomplished in several ways:

(1) By adoption of a limitation on catch of the stock of concern, for example through a special TAC for the SAP, adequately monitored through sufficient observer coverage.
(2) By adopting gear or fishing techniques previously demonstrated to reduce or avoid the catch of stocks of concern. In the case of a reduction, it must be shown that the reduction is sufficient that any increase in time fishing (effort) (through additional DAS allocations or differential DAS counting) will not increase the catch of a stock of concern beyond that which would result if the program were not approved.
(3) By a sufficient overall effort (fishing time) reduction or redirection such that there is no net increase in bycatch mortality.

(d) The SAP shall occur within a defined area
(e) Participation in the SAP cannot be limited to vessels from a particular state or political subdivision. This reduces the likelihood the SAP will be considered an allocation of resources to a particular community.
(f) To the extent practicable, the SAP must reduce discards and/or discard mortality of all species (consistent with requirements of the M-S Act).
(g) The proposed SAP shall not have significant impacts (as defined by NEPA), or, if significant, that these impacts were analyzed in the SEIS for Amendment 13 or later management action.
(h) The proposed SAP shall specify the type of data reporting to be utilized to monitor the status of harvest and should include a realistic plan of implementation.
(i) The RA shall make a finding that adherence to the prescribed conditions can be assured in light of available enforcement resources and in light of the enforcement record of vessel owners and operators of the vessels.

If a SAP request is submitted to the RA for approval in the process described in (2), the RA will:

- Perform an initial cursory review to insure the required elements are present.
- If all required elements are present, notify the Council of receipt of the SAP proposal within 21 days of receipt of the application.
- Publish a notice in the Federal Register requesting comment on the SAP proposal within a 30-day comment period.
- After considering comments from the Council and the public, make a determination on the proposed SAP and issue a permit authorization or regulations, as appropriate, within 60 days of the end of the comment period.

3.4.5.3.1 Georges Bank Yellowtail Flounder Special Access Program

From June through December, fishing vessels can make two trips per month into the area of Closed Area II south of 41-30 N (area opened for the scallop Closed Area II access program to target yellowtail flounder, see the following chart). Additional requirements for participation in this program include:

- Vessels are limited to 30,000 pounds of yellowtail flounder per trip.
- All vessels are required to use VMS.
- The DAS clock starts when entering statistical areas 561/562 (5zjm) (or that part of Closed Area II that lies outside statistical areas 561/562 (5zjm))
- The DAS clock stops when the vessel leaves statistical area 561/562 (5zjm) (or that part of Closed Area II that lies outside statistical areas 561/562 (5zjm))
- A vessel cannot fish outside statistical areas 561/562 (5zjm) (or that part of Closed Area II that lies outside of statistical areas 561/562 (5zjm))
- A vessel can fish inside Closed Area II and in statistical areas 561/562 (5zjm) on the same trip. A vessel cannot transit the part of Closed Area II that remains closed in order to fish in other parts of statistical areas 561/562 (5zjm).
- The number of total trips participating in this program is 320. The Regional Administrator may change the number of trips authorized based on projected catch of the GB yellowtail flounder TAC.
- Vessels will be limited to one-fifth of the daily GB cod trip limit specified for the US/CA Resource Sharing Understanding (e.g. 100 lbs. if the trip limit is 500 lbs./day) for the entire trip

Measures adopted to implement the US/CA resource sharing understanding may impose additional restrictions on this access program. The more restrictive measures will apply. For example, while fishing outside of CA II south of 41-30N, vessels must comply with the requirement to use a haddock seperator or flounder net.

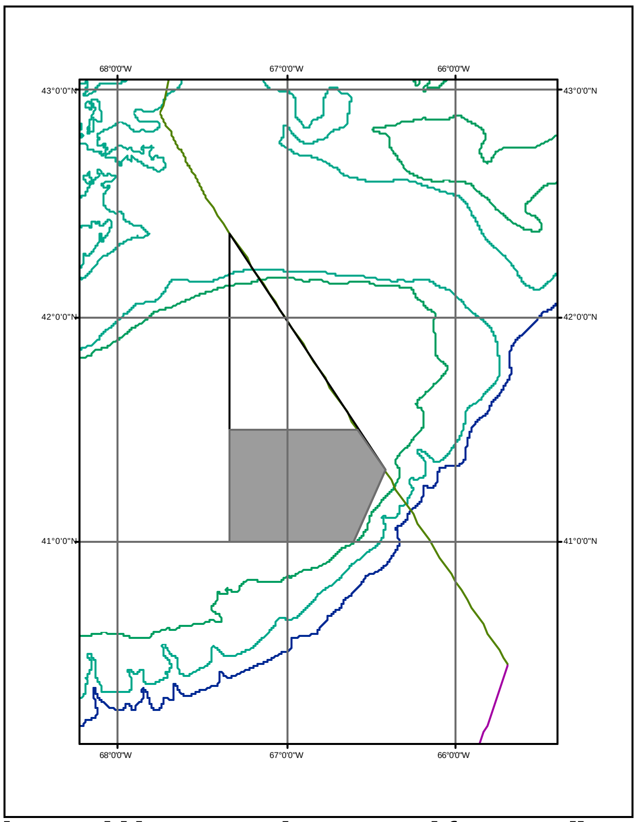


Figure 5 – Area in CAII that would be open under proposed for GB yellowtail flounder special access program

3.4.5.3.2 Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program

A vessel fishing for fluke west of 72-30W, using mesh authorized by the fluke plan and not on a groundfish DAS, is allowed to retain and land up to 200 lbs. of winter flounder subject to the following restrictions:

- Vessel must possess a valid federal fluke permit
- Winter flounder cannot exceed the amount of fluke on board
- The vessel operator must sign into this program for a minimum of thirty days and must have a letter of authorization from the Regional Administrator on board
- While in the program, a vessel cannot fish on a groundfish DAS
- All fishing must take place west of 72-30W
- Possession and/or landing of other groundfish is prohibited

Rationale: Vessels fishing for fluke occasionally catch small amounts of winter flounder. This program reduces regulatory discards by allowing landing of these small quantities, and it increases opportunities to land winter flounder. Analysis shows that many of the alternatives will reduce SNE/MA winter flounder catches more than necessary – this measure helps to mitigate those impacts.

3.4.5.3.3 US/CA Resource Sharing Understanding Special Access Program

These measures are proposed to facilitate taking of the U.S. share of cod, haddock, and yellowtail flounder as allocated under the U.S./Canada Resource Sharing Understanding (see section 3.4.5.3.3). These measures apply to statistical areas 5Zjm (see Figure 6). Only vessels with limited access permits will be allowed to participate in this program.

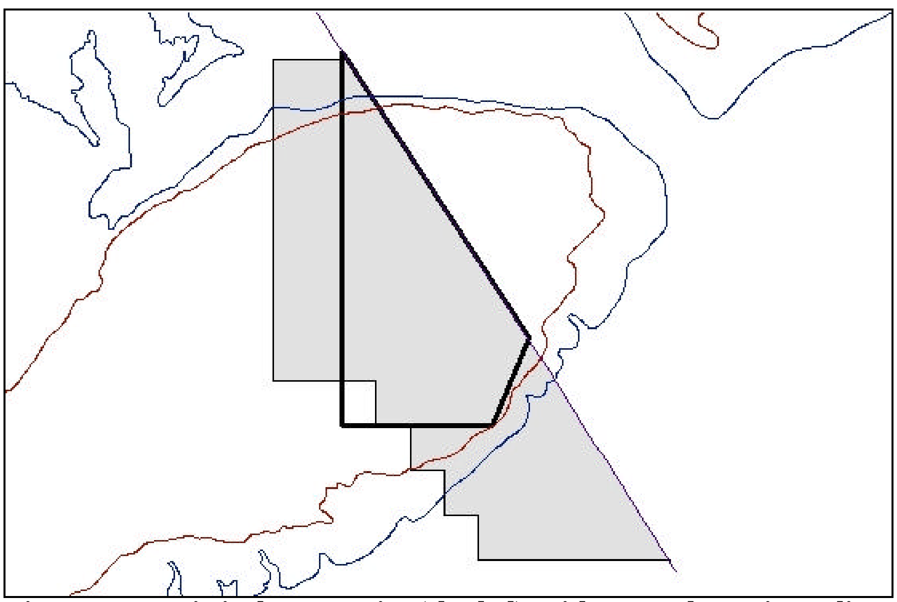


Figure 6 – Statistical areas 5zjm (shaded), with CAII shown in outline.

3.4.5.3.3.1 DAS Adjustment

Vessels fishing in the area may be charged DAS at a differential rate. The rate will range from 1:1 to not counting DAS all for vessels fishing in the area. These rates will be specified in a future action.

3.4.5.3.3.2 Gear

Vessels trawling in the area will be allowed to use different mesh size in their cod ends. Mesh can be adjusted downward from the U.S. regulations to the size used by Canadian vessels on eastern Georges Bank. Any gear changes may be specified in a future action.

3.4.5.3.3.3 Access to Closed Area II

Access will be provided to Closed Area II to facilitate catching haddock and yellowtail flounder. Access to the area north of the habitat area of particular concern and deeper than 100 fathoms will be provided for a period of ten months of the year. This area is bounded by the following points:

42-12.0N	67-11.0W	(intersection of 42-12.0N with the U.S. – Canada Maritime Boundary)
42-11.0N	67-20.0W	
42-22.0N	67-20.0W	(the U.S.-Canada Maritime Boundary)

Access will not be allowed during March and April in order to protect spawning haddock. At any time, the Regional Administrator can adjust the months the area is open in order to achieve and not exceed the US/CA TACs. Part of the area south of 41-30N will be open for yellowtail flounder fishermen; details of this program are in section 3.4.5.3.1. A vessel will be allowed to fish in Closed Area II, both north and south of 41-30N on the same trip if both areas are open, but cannot transit closed areas when transiting between the two programs.

Rationale: The area subject to the US/CA understanding is well offshore. DAS reductions proposed in this amendment may discourage U.S. fishermen from transiting to this area. A possible result is that U.S. fishermen would not harvest their share of haddock and yellowtail flounder (there are likely to be very low limits on GB cod catches due to the need to rebuild that stock). This program will provide incentives for U.S. fishermen to transit to the area and target haddock and yellowtail flounder, while protecting cod stocks. Limits on where fishermen can fish on these trips are intended to prevent confusion attributing catches to a particular stock. Allowing fishing in the northern part of CAII is designed to provide access to haddock. The requirement to use either a haddock separator trawl or a flounder net will reduce cod bycatch. In any case, the US/CA understanding includes a hard TAC on GB cod taken in this area, so participation in this SAP will not harm cod rebuilding as long as catches (both landings and discards) can be adequately monitored.

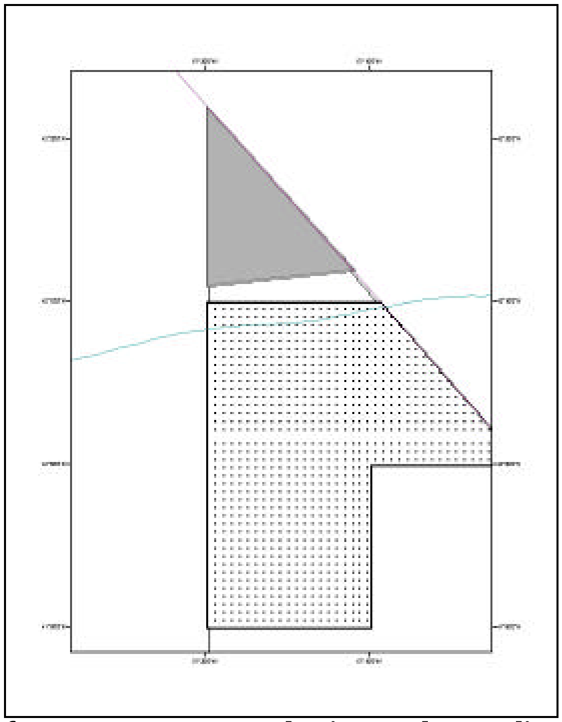


Figure 7 – Area authorized for US/CA Resource Sharing Understanding SAP. (Shaded area is area authorized, stippled area is cod HAPC)

3.4.5.3.3.4 Adjustments

Any of these measures can be adjusted by the Regional Administrator in order to achieve, or not exceed, the appropriate TAC as established by the US/CA resource sharing understanding.

3.4.5.3.4 Hook Gear Closed Area I Special Access Program

Vessels using hook gear may participate in a program to access haddock in Closed Area I.

Area

Participants may fish in the area defined by the following coordinates (loran coordinates shown for information only):

41–24.5N 069-18.5 W (43800/13700)
41-25.5N 069-14.5W (43800/13675)
41-08.0N 068-59.5W (43680/13675)
41-07.0N 069-04.0W (43680/13700)

Season

Hook: September 16 through December 31

Incidental Catch Limits

Hook: 35 mt incidental catch of cod., 400 lbs/trip. Access program closes when cod limit is projected to be caught.

Gear Restrictions

Hook: Maximum of 3,600 circle hooks, 12/0.

Administrative Requirements

Vessels must declared into the access program in advance of sailing. No fishing is allowed outside the area boundaries on a dedicated closed area access trip.

Observer Coverage
Observers are required on all trips.

VMS
All vessels must be equipped with an approved VMS.

Rationale: Proposed measures are likely to reduce fishing mortality on GB haddock well below the level called for in the rebuilding program. This SAP will provide an opportunity for hook gear to target that resource, mitigating some of the impacts of other measures on that sector and helping the plan to achieve OY for that stock. The strict limits on cod bycatch are intended to prevent the program from harming cod rebuilding, and to act as an incentive for more selective fishing practices. With all trips covered by observers, the catches can be closely monitored and the program can be closed if necessary.

3.4.6 Closed Area Administration

3.4.6.1 Clarification of closed area rationale

Year round closed areas have both direct and indirect benefits. Direct benefits are related to the species managed by the management plan, and include reductions in fishing mortality (that may remove need for other management measures), protection of spawning fish, etc. Indirect benefits can be protection provided to stocks not included the FMP (including reduced fishing mortality or spawning protection), habitat, etc. When closures are adopted, the Council will:

- Define the intent and specific purpose for the closure;
- Explicitly describe the duration of the closure, who can fish in the closed area, and who cannot fish in the closed area.

Rationale: Many of the existing closed areas have been adopted at different times – in some cases, the closed areas have existed in some form for over thirty years. This statement of intent clarifies the reasons for closed areas and can be used to evaluate changes to the areas in the future.

3.4.6.2 Flexible Area Action System

The FAAS system will be eliminated and not replaced.

Rationale: because the regulatory requirements necessary to implement a closure were too cumbersome to react quickly to changing resource conditions. Given the analysis requirements of NEPA and the M-S Act, it is not likely that the system will ever respond quickly enough to a short-term resource condition to implement a closure. Removing this measure will simplify the regulations.

3.4.7 DAS Leasing Program

Rationale: The DAS leasing program that follows is intended to provide flexibility for fishermen to adapt to the proposed measures in this amendment. Significant DAS reductions may make some vessels unprofitable. The leasing program allows for the transfer of DAS so that vessels that decide not to fish for groundfish can earn some revenue from their DAS by transferring them, on a short term basis, to other vessels who will fish them. Because of concerns over how these transfers may change the character of the fishery, transfers between vessels of different sizes are limited to the permit upgrade restrictions. Finally, the impacts of this program are subject to uncertainty, so the program is scheduled to end in two years unless extended by Council action.

3.4.7.1 Basic elements

The following elements form the basis for a leasing program.

- Term of Lease: DAS would be leased for only one fishing year.
- Vessels may lease DAS from more than one other vessel (conversely vessels may lease DAS to more than one vessel) subject to conservation equivalency provisions.
- DAS may be leased on a unit basis where a unit is defined as being 1 DAS or 24 hour increment.
- Leases would not be subject to a "conservation tax."
- Renewal of Lease: Vessels may renew leased DAS on an annual (fishing year) basis.
- Required Use: Leased DAS must be used in the same fishing year they are acquired
- Prohibition on Carry-Over: Leased DAS may not be used as part of any carry-over.
- Limit on Leasing by Category: DAS available for leasing shall be limited to only Category A DAS; DAS that may be immediately available for use.
- Registration of Leases: Lease agreements must be registered with the NMFS Northeast Regional Office (NERO). Administrative process based on two possible approaches 1) internal administration by NERO or 2) external administration by approved "brokers" (for example, permit brokers could be sanctioned by NERO to document exchanges and provide data to NERO for monitoring and enforcement purposes) to be developed.
- Permit History: the lease agreement must clearly state which permit retains the history of the leased DAS

3.4.7.2 Conservation Equivalency

A lessor may not lease DAS to any vessel with a main engine horsepower rating that is 20% more than that of the lessee and may not lease DAS to any vessel that is 10% more than that of the lessee vessel's LOA. These criteria are based on the permit baseline. (Note that these restrictions do allow a larger vessel to lease DAS to a smaller vessel).

Rationale: DAS leasing could result in a net increase in fishing mortality if DAS are transferred across disparate platforms. This measure limits lease agreements to vessels that meet specified vessel size categories. They are consistent with restrictions on upgrading a vessel, with the exception that the tonnage restrictions are not adopted to facilitate administration of the program.

3.4.7.3 Sub-leasing DAS

DAS cannot be sub-leased.

Rationale: This provision is intended to simplify administration of the program.

3.4.7.4 Limitations on Number of DAS Leased

A vessel can lease the number of DAS equal to its allocation for fishing year 2001 (not including carry-over DAS). The total number of Category A DAS available to a vessel under Amendment 13 is thus its Amendment 13 allocation and any leased DAS, with the leased DAS not exceeding the vessel's allocation in FY 2001 (not including carryover DAS).

Rationale: This provision reduces the possibility that a vessel will accumulate excess DAS.

3.4.7.5 Permit History Provisions

To clarify the implications of leasing DAS on permit history, the following policies will be followed:

- The history of DAS use remains with the permit that "owns" the DAS (that is, the lessee retains the DAS history of any DAS leased to another vessel –even after the DAS are leased).
- Any landings associated with leased DAS remain with the permit that lands the fish.
- If a vessel does not use all the DAS that are allocated to it and that it leases, leased DAS are considered used first.

Rationale: These provisions standardize the treatment of DAS and landings history in order to simplify administration of the program. Allowing a vessel that "owns" the DAS retain the history of those DAS will alleviate the concern that leasing out a DAS will affect future decisions, if any, that are based on DAS history. Considering leased DAS as used first reduce the possibility that a lessor will acquire DAS in excess of his ability to use them.

3.4.7.6 Interaction with Monkfish DAS

According to the existing monkfish FMP, vessels that possess a Category C or D monkfish permit must use a multispecies DAS when using a monkfish DAS. A multispecies permit holder that leases DAS to another vessel should be aware that if the number of multispecies DAS retained (not leased) is less than the number of monkfish DAS allocated, the permit holder may not be able to use all his monkfish DAS while fishing with a Category C or D monkfish permit. This may not be a concern if a future monkfish amendment separates groundfish and monkfish DAS use.

Example: Original DAS allocation: 40 multispecies/40 monkfish
DAS after leasing: 20 multispecies/40 monkfish
Monkfish DAS that can be used: 20 monkfish

Rationale: This section clarifies the interaction between leasing of multispecies DAS and the use of monkfish DAS.

3.4.7.7 Expiration of Leasing Program

The DAS leasing program will automatically expire after two years unless extended by a future Council action. There is no implicit or explicit guarantee that the DAS leasing program will be renewed.

Rationale: This sunset provision means that the program will be reviewed after two years and any necessary modifications can be made at that time, or the program can be terminated. Vessel owners entering into lease agreements should recognize that absent a future Council action, the DAS leasing program will be in place only for fishing years 2004 and 2005. A future action could terminate the DAS leasing program before FY 2005, or could extend it past that date.

3.4.7.8 Confirmation of Permit History

Any permit in the permit history category cannot lease DAS to an active permit.

Rationale: This provision slows the re-activation of effort that is frozen in the permit history category.

3.4.8 Recreational Fishing Permit

Four options were considered for requiring a recreational fishing permit. The proposed action is the No Action alternative – no recreational permit is required.

Rationale: The administrative problems and costs of a recreational permit were seen as obstacles to this program unless improved reporting could be adopted as well.

3.4.9 "Running clock" alternatives

The "modified running clock" will remain in effect as described in current regulations. Under this regulation, a vessel fishing for less than a full 24 hour block of time can land a daily possession limit for the last day as long as the operator does not call out of the DAS program until the final 24 hours have elapsed. This requirement starts on the second day of a trip. No other changes are being made to the running clock by this amendment.

Rationale: No changes are made to the current running clock because of enforcement and administrative concerns.

3.4.10 Observer Coverage

The Council desires 10 percent observer coverage of all gear sectors. No later than 2006, NMFS will determine if this level of observer coverage is sufficient to monitor catches and discards in the groundfish fishery with an acceptable level of precision and accuracy. The level of desired observer coverage will be adjusted (increased or decreased) consistent with that analysis.

Rationale: The Council does not manage the observer program. Nevertheless, this measure is intended to reflect the Council's recognition that adequate observer coverage will foster improved information that can be used to manage the groundfish fishery. In April 2003, NMFS advised a federal court that 5 percent observer coverage provides an acceptable level of precision.

3.4.11 Modified VMS Operation Requirements

A vessel using a VMS can opt out of the program for a minimum period of one calendar month by notifying the Regional Administrator (RA). Notification must include the date a vessel will resume transmitting VMS reports. A vessel cannot resume fishing (for any species) prior to that date. After receiving confirmation from the RA, the vessel operator can stop sending VMS reports. During the period out of the program, the vessel cannot participate in the following activities:

- Engage in any fishery
- Operate (meaning transit) in the Exclusive Economic Zone with gear capable of catching groundfish, unless that gear is properly stowed below decks.

While this provision facilitates cost savings for vessels that exit the fishery for an extended period of time, it does not authorize a vessel required (because of participation in a SAP, fishing in the US/CA Understanding area, etc.) or voluntarily using a VMS, to switch back and forth between the VMS and call-in programs.

Rationale: Current regulations require a vessel equipped with a VMS to send position reports for the entire year (unless hauled out). This requirement results in unnecessary costs to vessels since they have a limited number of DAS available. In many instances, these costs include not just the communication costs charged by the vendor, but the costs of running a generator to provide electrical power to the unit. This measure provides an opportunity to reduce costs since a vessel operator can choose to turn his vessel's VMS off if exiting the fishery for an extended period. In order to address enforcement concerns, strict limitations are placed on the vessel's activity during this period. The requirement that gear capable of catching groundfish be stowed below decks is more strict than the normal stowage requirements for transiting closed areas.

3.4.12 Day Gillnet Block Out of the Fishery

There will not be any changes to existing requirements for day gillnet vessels to take blocks of time out of the fishery (the No Action alternative).

Rationale: This requirement limits the ability of day gillnet vessels to compensate for reduced DAS by extending soak time.

3.4.13 DAS Counting

No changes will be made to the method used to count DAS. DAS will be counted based on hours and minutes for all vessels (the No Action alternative). Day gillnet vessels will continue to be charged a minimum of 15 hours for trips over three hours in length.

Rationale: Changes to the way DAS are counted would be an administrative burden with few benefits. All of the DAS analyses and allocations used in the amendment would have to be recalculated. Changing the way DAS are counted could also result in unsafe fishing practices, as small vessels could react by choosing to fish a full twenty-four hours without adequate crew size.

3.4.14 Reporting Requirements

The proposed action requires a closer link between vessel, dealer, and DAS reporting. Timely information on area fished is required to know which measures apply to the vessel, and to monitor landings accurately. Programs such as the proposed Special Access Programs and the US/CA Resource Sharing Understanding require timely landings information so that targeted catch levels are not exceeded.

3.4.14.1 Dealer Reporting Options

Dealers will be required to use daily electronic reporting where the dealer records the vessel's trip identification number and disposition of catch (e.g., human consumption, bait, animal food, reduction, etc.) along with the current set of data elements for all vessel purchases. Reports are due to NMFS within twenty-four hours of the transaction. The trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction. Electronic reporting systems would replace the current paper based dealer reporting as well as the IVR reporting for cod and haddock and other species under various FMPs. Until such time as an electronic reporting system is in operation, existing reporting requirements remain in effect.

Rationale: Daily electronic reporting will improve the timeliness of information on groundfish landings. Delaer landings, however, do not have any information on catch location. The reporting of a trip identifier will create a link between the location (statistical area) information reported in VTRs and the landings reported by dealers. This will improve estimates of catches by stock area and enable more timely monitoring of removals by stock.

3.4.14.2 Vessel Reporting Requirements

The vessel owner/operator will be required to report a vessel trip identification number to the dealer where the vessel is offloading its trip. This may be generated by the vessel using such current information as the VTR serial number, days-at-sea call-in number or a number generated by VMS, and reported to the dealer for submission to NMFS. Alternatively, the dealer may generate the number such as an invoice number for the fish received and provide the number to the vessel, which would submit it to NMFS along with the remaining trip information. The vessel trip identifier would link the dealer and vessel information for each trip. This would improve the utilization of both data sets and allow for the identification of the stock area that was fished. This is essential to monitoring of catch allocations by stock area.

Once an approved, viable electronic system becomes available, it will replace the current VTR. Under this option, vessels would report all of the information currently required by the VTR, as well as the following information: a) password; b) trip identifier; and c) landings information by NMFS statistical area. Reports would be submitted at least at the current statistical area level of reporting. As a means of reporting, vessels would have the option of using any approved, viable electronic means possible to report this information.

The trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.

Rationale: As noted in the previous section, the use of a trip identifier will create a closer link between dealer and vessel reporting. The current paper reporting system for VTRs is time –consuming, slow, and costly. Electronic vessel reporting will speed the collection of catch information from vessels.

3.4.15 Hand Gear-Only Permit Alternatives

3.4.15.1 Permits

The current open access handgear permit will be changed to include two different categories of permit. Handgear permits will include the use of hand-hauled tub trawls limited to 250 hooks.

> Category A - To be eligible, a vessel in the NE Multispecies Open Access Handline/Rod and Reel category must have landed 500 pounds of cod, haddock or pollock in at least one of the fishing years from 1997 to 2002. Category A hand gear only permits can be transferred from one vessel to a replacement vessel.
>
> Category B - Open access

Rationale: Only a small fraction of category H permit holders have either reported landings of regulated groundfish in either the dealer or VTRs these permit holders do depend on regulated groundfish for at least a portion of their fishing income. Nevertheless, the large number of permit holders represents a potential latent effort problem that is better addressed through management action in Amendment 13 rather than ignored. This measure limits the number of hand-gear permits that can fish to those that were active during the period 1997 through 2002. At the same time, it creates a second hand gear category that allows a small open access fishery to continue.

3.4.15.2 Management Measures

The management measures will differ for the two permit categories.

Category A – Trip limit will be 300 pounds of cod, trip limits for all other species shall be the same as for limited access (DAS) vessels. Cod trip limit to be adjusted proportionally to DAS vessels; i.e. if GOM cod trip limit doubles then the Category A trip limit would double and vice versa. Category A vessels will be subject to the same year-round and seasonal rolling closures as DAS vessels.

Category B - Trip limit will be 75 pounds of cod, trip limits for all other species shall be the same as for limited access (DAS) vessels. Cod trip limit to be adjusted proportionally to DAS vessels; i.e. if GOM cod trip limit doubles then the Category B trip limit would double and vice versa. Category B vessels will be subject to the same year-round and seasonal rolling closures as DAS vessels.

Rationale: By creating a limited access and open access handgear permit, the Council is able to manage the hand gear fishery in a way that mitigates adverse economic impacts for the current hand-gear participants while preventing any adverse biological effects should the open access hand-gear permits become more active. While the low trip limit associated with the open access category will discourage significant participation, that trip limit could be increased in the future as stocks rebuild.

3.4.16 Sector Allocation Alternatives

3.4.16.1 Sector Allocation

This option is not proposed as a stand-alone option for a system of management to be implemented by Amendment 13. Rather it is envisioned as an option that might be adopted in addition to and independent of the principal management option chosen for Amendment 13 (e.g., hard TACs, DAS management, Area management, etc.).

A sector allocation system would apportion part or all of groundfish fishery resources (denominated in terms of catch) to various industry sectors. While vessels might be assigned to sectors based on factors such as gear used, permit category, vessel size, homeport, area fished, etc., this measure allows vessels to form sectors of their own choosing. Such self-selected sectors might be based on common fishing practices, vessel characteristics, community organization, or marketing arrangements, but this would not be required. Since self-selection of sector membership would not necessarily be based on any common vessel or gear characteristics this alternative offers a great deal of flexibility in the formation of sectors. A group of permit holders would simply agree to form a sector and submit a binding plan for management of that sector's allocation of catch or effort. Allocations to each sector may be based on catch (hard TACs) or effort (DAS) with target TACs specified for each sector. Vessels within the sector would be allowed to pool harvesting resources and consolidate operations in fewer vessels if they desired. One of the major benefits of self selecting sectors is that they provide incentives to self-govern, therefore, reducing the need for Council-mandated measures. They also provide a mechanism for capacity reduction through consolidation.

3.4.16.1.1 Formation of a Sector

Participation in a self-selecting sector would be voluntary. Vessels that did not decide to join would remain in a common pool which would fish under the constraints impose by the Council. Individuals that wished to form a sector and receive an allocation of catch or effort would be required to submit a proposal for formation of a sector and a legally binding plan of operations which would require approval from the Regional Administrator. These would be agreed upon and signed by all members of the sector.

The motivation to form or join a sector could be for several reasons: a desire of its members to consolidate operations in fewer vessels (reducing the cost of operations and possibly facilitating the profitable exit of some individual vessel owners from the fishery); assurance that the members of the sector would not face reductions of catch or effort as a result of the actions of vessels outside the sector (e.g., if the other vessels exceed their target TACs), and, potentially, freedom from restrictive regulations not needed to meet conservation objectives if the sector is constrained by a hard TAC (e.g., trip limits and potentially some time-area restrictions).

3.4.16.1.1.1 Preparation of a sector formation proposal and operations plan

The formation proposal and operations plan submitted by a self-selecting sector must have, at a minimum, the following components:

- A list of all participants and a contract signed by all participants indicating their agreement to abide by the operations plan accompanying the proposal.
- An operations plan detailing the following:
  - A list of all vessels that would be part of the sector including an indication for each vessel of whether it would continue to fish;
  - The original distribution of catch history, TACs, or DAS within the sector;
  - A detailed plan for consolidation of TACs or DAS, if any is desired, including a detailing of the quantity and duration of any redistribution of TAC or DAS within the sector;
  - A plan and analysis to show how the sector will avoid exceeding their allocated TACs (or target TACs if the allocation is in terms of DAS). This plan should include provisions for

monitoring and enforcement of the sector regulations, including documentation of both landings and discards;
- o Rules for entry and exit to the sector (see more on this in next section) including procedures for removing or disciplining members of the sector who do not abide by its rules. Rules for entry and exit must also define how catch or DAS history that is developed by vessels participating in a sector is assigned to each vessel;
- o Procedure for notifying the National Marine Fisheries Service if a member is expelled from the sector for violation of sector regulations.

An appropriate NEPA document assessing the impacts of forming the sector must be prepared. This will be written by the sector applicants, and submitted to NMFS through the Council. The contracts drawn up for the whiting and pollock cooperatives on the West Coast and Alaska might serve as a guide for determining the form and content of these plans.

3.4.16.1.1.2 Sector Review and Approval

Once a group organizes and prepares a sector operations plan, the plan must be reviewed and approval given before the sector can operate. A sector will submit its operations plan to the Council no less than one year prior to the date that it plans to begin operations. An exception to this date will be made for the Cape Cod hook sector proposal included in this amendment. The Council will consider this plan in the course of the periodic adjustment process and will implement it through that process.

3.4.16.1.1.3 Movement Between Sectors

Each sector will set its own rules on movement into and out of the sector.

Rationale: By not mandating the commitment time to a sector and allowing the sectors to set their own rules, the sector might be more successful in the long-term. This success will be realized, while working within their allocation (hard TAC or DAS), the group will be largely self-regulating. A code of conduct for all sectors should be developed by the Council or by industry with Council approval.

3.4.16.1.2 Allocation of Resources

Allocation of resources will be based on documented catch. Thus, allocated TACs would be based on the accumulated catch histories over the previous five years of each member of the self-selected sector. For any sectors formed that target GB cod during the period 2004 through 2007, landings will be based on fishing years 1996 through 2001. Note that this accumulated catch history would be allocated to the sector as a whole and not necessarily to individual vessels within the sector. The self-selecting sector would then have to develop its own set of rules to distribute the sector's allocation among its membership.

Allocation of TACs must be consistent with the measures adopted for the remainder of the fishery. If measures designed for the rest of the fishery will reduce mortality of a species well below its target, it may be inappropriate to base the TAC for a sector on the target fishing mortality.

Rationale: The use of a specified period for sectors targeting GB cod is so that allocation of resources will be consistent with the period used for the GB cod hook sector. Documented catch refers to catch that was reported to NMFS through a required reporting system.

3.4.16.1.2.1 Mortality/Conservation Controls

It will be necessary to establish appropriate restrictions on catch or effort for each sector to ensure that they do not exceed their allocation of TAC (through landings or discards). Hard annual TACs by species will be allocated to the sector as a whole. The sector would be required to submit an operating plan for approval by the regional administrator. The plan would detail the allocation of TAC within the group , how the catch of the sector would be monitored, and a plan for operation or cease of operations once the TACs of one or more species were taken. The plan would have to provide assurance that the sector would not exceed the target TACs allocated to it (either through landings or discards).

3.4.16.1.2.2 Enforcement of Sector Provisions

It will be the responsibility of each sector to enforce any provisions adopted through procedures established in the operations plan and agreed to through the sector contract. Ultimately, a sector may desire to expel a member due to repeated violations of sector provisions. Once a vessel enters into a sector, it cannot fish during that fishing year under the regulations that apply to the common pool. In other words, if a vessel is expelled from a sector, it cannot participate in the groundfish fishery during the remainder of that fishing year.

For the purposes of enforcement, a sector is a legal entity that can be subject to NMFS enforcement action for violations of the regulations pertaining to sectors. Vessels operating within a sector are responsible for judgments against the sector.

3.4.16.1.2.3 Interaction of Sector with Common Pool Vessels

As noted above, sectors will be assigned a TAC share (percentage of total TAC) based on some history period. While it is appropriate for changes in stock condition to affect the amount of fish that the share represents, sectors should not suffer if other sectors, or common pool vessels, exceed target or hard TACs and create a need for mortality reductions.

If a sector does not exceed its assigned TAC in a given fishing year, but other sectors or common pool vessels do, the sector's quota [in absolute (not share) terms] in the following years will not be reduced. This does not permanently change the sector's percentage of the total TAC, however. In the extreme case, the total resources available may be less than a sector's absolute quota. In this instance, the sector's share will be temporarily increased by the percentage that other sectors exceeded their quota. As stock conditions improve, the sector will keep this temporary increase in share until its annual quota is the same as it was prior to the stock decline. The sector's permanent share will then revert to its original share.

If a sector exceeds its TAC, the sector's quota will be reduced in the following year and the sector may be subject to enforcement action. If the sector exceeds its TAC repeatedly, the sector's share can be permanently reduced as a penalty or the sector's authorization to operate withdrawn.

If declining stock conditions result in a need to reduce fishing mortality, and all sectors and common pool vessels have operated within target or hard TAC limits, a sector's share will not be changed, but the amount this share represents may be due to reduced overall TACs.

If stock conditions improve, and a sector stays within its quota while other sectors do not, the sector will receive a temporary increase in share equal to the amount that other sectors exceeded their quota.

Some management provisions that apply to common pool vessels will also apply to any vessel in a sector. This list may be modified through a framework adjustment. Measures that are not included in this list may be altered through a sector's operations plan, if approved by NMFS. These are:

If quotas are allocated to a sector:

- Year round closed areas
- Permitting restrictions (vessel upgrades, etc.)
- Gear restrictions designed to minimize habitat impacts (roller gear restrictions, etc.)
- Reporting requirements (not including DAS reporting requirements)

3.4.16.1.3 VMS Requirements

There is no VMS requirement specific to this alternative; however, if other alternatives must be used in conjunction with the sector allocation alternative, then any VMS requirements under those alternatives will be imposed on the sectors. Sectors may establish their own VMS requirements as long as they remain in compliance with any other VMS requirements established by other alternatives adopted in conjunction with sector allocation.

3.4.16.1.4 Possible Modifications

Changes in the necessary mortality reduction will result in changes of the amount of the resource assigned to each self-selecting sector. This will not impact the process of approving and implementing a sector.

3.4.16.2 Georges Bank Hook Sector

This alternative creates a sector for hook fishermen. The sector is designed for vessels that harvest Georges Bank cod. Participation in the sectors is voluntary; permit holders must elect to participate in the sector. The allocation of resources for each sector will depend on the history of the permit holders that choose to participate. This is not a stand-alone alternative, but is intended to be implemented with one of the other alternatives. Provisions for adjusting TACs if a sector or other vessels exceed a TAC will be as described in section 3.4.16.1.2.2.

Participation in this sector is open to vessels that use jigs, demersal longline, or hand gear to harvest GB cod. Permit holders must declare their intention to participate in the sector at least three months in advance of the beginning of the fishing year. Once declared into the sector, the vessel must remain in the sector for the entire fishing year and must abide by the regulations applicable to the sector for the entire year. If a permit is transferred during the fishing year, the new owner must also comply with the sector regulations for the remainder of the fishing year.

TAC

A GB cod quota (hard TAC) will be allocated to the sector. The sector's share of the overall GB cod TAC will be determined by calculating the share of the GB cod harvest taken by hook gear (sector participants) during fishing years 1996 through 2001. When the TAC is reached, the commercial components of the sector will cease fishing for the remainder of the fishing year.

Management Measures

Management measures will be specified in the sector operations plan.

3.5 Alternatives to Control Capacity

There is a concern that excess fishing capacity in the groundfish industry will slow rebuilding efforts and prevent the economic success of those vessels in the fishery. More DAS and permits are available than are active in the fishery, yet at 2001 used DAS levels – a fraction of the allocated effort – fishing mortality is too high. The proposed action addresses these concerns. See section 9.4.2.5 for additional background on capacity concerns.

3.5.1 Policy on Cooperative Research

The proposed action limits the use of DAS allocated to a permit based on the history of DAS use. The Council's policy is that a vessel will not lose DAS because of documented participation in a research project or experimental fishery. These instances will have to be evaluated by the Regional Administrator on a case-by-case basis. If a permit holder believes that allocation of DAS under Amendment 13 has been limited by the vessel's participation in a research project or experimental fishery, the permit holder should provide NMFS documented proof of the time spent participating in the research project that was not considered for its Amendment 13 DAS authorization. NMFS will review the information and consider adjusting the DAS allocation.

3.5.2 Days-At-Sea Transfer

This alternative allows multispecies limited access permit holders to permanently transfer DAS to other multispecies limited access permit holders, with some restrictions. The objectives of this alternative are to provide greater economic opportunity and flexibility in all fisheries, while maintaining the character of the existing fleet and to achieve some long-term reduction in fishing effort by removing active and inactive DAS from the groundfish fishery.

Rationale: This measure provides a limited opportunity for some consolidation in the groundfish fishery. Transfers are constrained by vessel upgrading restrictions in order to prevent increases in fishing effort from occurring rapidly and to help maintain the character of the fishery. By applying a conservation tax on the transfer of DAS, the proposal will reduce not just the number of vessels in the fishery but will reduce allocated DAS. Vessels transferring their groundfish DAS must leave all federal and state fisheries in order to prevent this program from merely transferring excess harvesting capacity into other fisheries.

3.5.2.1 Measures

All transfers of DAS are limited to multispecies limited access vessels. The LOA or gross registered tonnage of the purchasing vessel may not be more than 10% greater and its horsepower may not be more than 20% greater than the baseline of the selling vessel. The selling vessel is required to retire from all state and federal commercial fisheries. Consistent with the DAS leasing proposal, a history permit cannot transfer its DAS to another vessel.

Rationale: Fishing effort may increase if transfers of DAS take place between vessels of disparate size. This restriction reduces those concerns. Requiring the vessel to leave all state and federal fisheries removes the possibility that reducing effort in this fishery will result in a transfer of that effort into other fisheries.

3.5.2.2 Restrictions

Only those vessels with a history of landing groundfish or another species during the period used to define effective effort (fishing years 1996 through 2001, as defined below) may transfer DAS with a reduction in fishing privileges for the recipient. Transferred active DAS (Category A or B DAS) will be reduced by 40% and inactive (Category C) DAS will be reduced by 90%.

Rationale: By limiting transfers of DAS to vessels that have a history of fishing, the possibility that this proposal will result in a re-activation of latent effort is reduced.

3.5.2.3 Reactivation of DAS – (DAS Use by Permit Buyer)

All DAS acquired by a vessel under this alternative may be used immediately following the transaction.

Rationale: The Council considered phasing in the use of these DAS over time in order to reduce the possibility that unused effort would rapidly enter the fishery under this measure. This provision, however, would make this measure unattractive to fishermen and would hinder its use. The combination of the effective effort baseline (see below) and the limit of these transfers to vessels that were actively fishing reduces the possibility that this action will rapidly introduce unused effort into the fishery.,

3.5.3 Days-At-Sea Reserve

3.5.3.1 Measures

DAS allocated to each permit are divided into three categories. First the number of effective DAS (documented DAS that were used during a baseline period, see section 3.5.3.5.-Defining Effective Effort) is defined for each permit. DAS not defined as effective are called Category C DAS. The effective DAS are divided into Category A and Category B DAS.

Category A DAS: The number of effective DAS that are available for use upon implementation of Amendment 13.
Category B DAS: The number of effective DAS that cannot be used at the implementation of Amendment 13 in order to achieve mortality objectives. These DAS will be further subdivided into "B regular" and "B reserve" DAS, with different restrictions on the use of those DAS.
Category C DAS: Latent days that are equal to the difference between a vessel's documented effective DAS and the Amendment 7 allocated DAS.

Example-- Consider a fleet allocation vessel with 88 DAS in fishing year 2000 and assume that this vessel can document a total of 60 DAS in the call-in system during the baseline period. If the rebuilding program required a 30% reduction in effective DAS the total number of DAS in each category for this vessel would be 42 DAS in Category A, 18 DAS in Category B, and 28 DAS in Category C.

3.5.3.2 Reserve DAS

All Category B and C DAS will be placed in a reserve account for each vessel. DAS in the reserve will be frozen at a fixed amount. Upon implementation of Amendment 13, Category A DAS may be used to fish for any stock of groundfish. Category "B regular" DAS can be used to target healthy stocks, subject to conditions defined through Council action, and Category "B reserve" DAS can only be used in an approved Special Access Program. As rebuilding occurs, Category B DAS may be re-activated from the reserve account first, followed by Category C DAS. All Category B DAS will be restored before any Category C DAS may be released from the reserve. Vessels that have documented activity in the groundfish fishery will restore their DAS before vessels that did not fish during the baseline period.

Rationale: The excess number of DAS available to groundfish complicates management efforts. In recent years, as stocks have started to rebuild, these unused DAS have re-entered the fishery, keeping fishing mortality rates higher than desired. Attempts to reduce overall DAS are complicated by these unused DAS as well, since an across the board reduction penalizes active fishermen more than those who are not currently using their DAS. Understandably, however, many fishermen oppose permanently taking DAS away from any permits, since the permit is not as valuable if it cannot be fished. This program reduces the number of DAS that can be fished on any stock (Category A DAS), while keeping the total number of DAS assigned to a permit at a fixed level. Many of those DAS, however, cannot be used until stocks rebuild, slowing their entry back into the fishery.

3.5.3.3 Conservation Tax on Category C DAS

A conservation tax will be applied to reactivated Category C DAS. The tax rate will depend on resource conditions at the time at which Category C days are withdrawn from the reserve.

3.5.3.4 Reactivation of Category B or C DAS

Whether Category B or C DAS are used in the future and the rate at which they return to use depend on the response of stocks to the management program. The Council may decide in the future to allow the initial reactivation of a portion of Category B and the subsequent reactivation of Category C DAS during the FMP annual adjustment process. Reactivation rates will be determined by the following formula:

Number of Category B or C DAS a permit holder may reactivate =

*(No. of B or C DAS Held) * (Cat. B DAS Allowed to Re-enter / Total No. B or C DAS that exist)*

Example: For a permit holder with 20 Category B DAS where 5,000 Category B are allowed back into the fishery and 50,000 B DAS exist,
*(20) * (5,000 / 50,000) = 2 Category B DAS allowed to renter the fishery.*

3.5.3.5 Defining Effective Effort

Effective effort is defined as the maximum DAS used in any single fishing year from FY 1996 through FY 2001. Qualifying years are only those in which a vessel landed 5,000 pounds or more of regulated groundfish (landings must be documented in the NMFS reporting system).

> *Example (1):* A fleet permit used fifty DAS every year from FY 1995 through 2001, but never landed 5,000 pounds of regulated groundfish in any single year.
>
> Effective effort: 0 DAS
> Category C DAS: 88
>
> *Example (2):* A fleet permit used 88 DAS in FY 1996 to land less than 5,000 pounds of regulated groundfish, and used 50 DAS in FY 2001 to land more than 5,000 pounds of regulated groundfish.
>
> Effective effort: 50 DAS
> Category C DAS: 38 DAS

3.6 Management Measures to Address Rebuilding Requirements

The following measures have been designed to achieve specific fishing mortality reductions described in section 3.2. The needed fishing mortality reductions are based on the selected rebuilding trajectory and/or ending overfishing. Statistical area and thirty minute square charts are provided for reference.

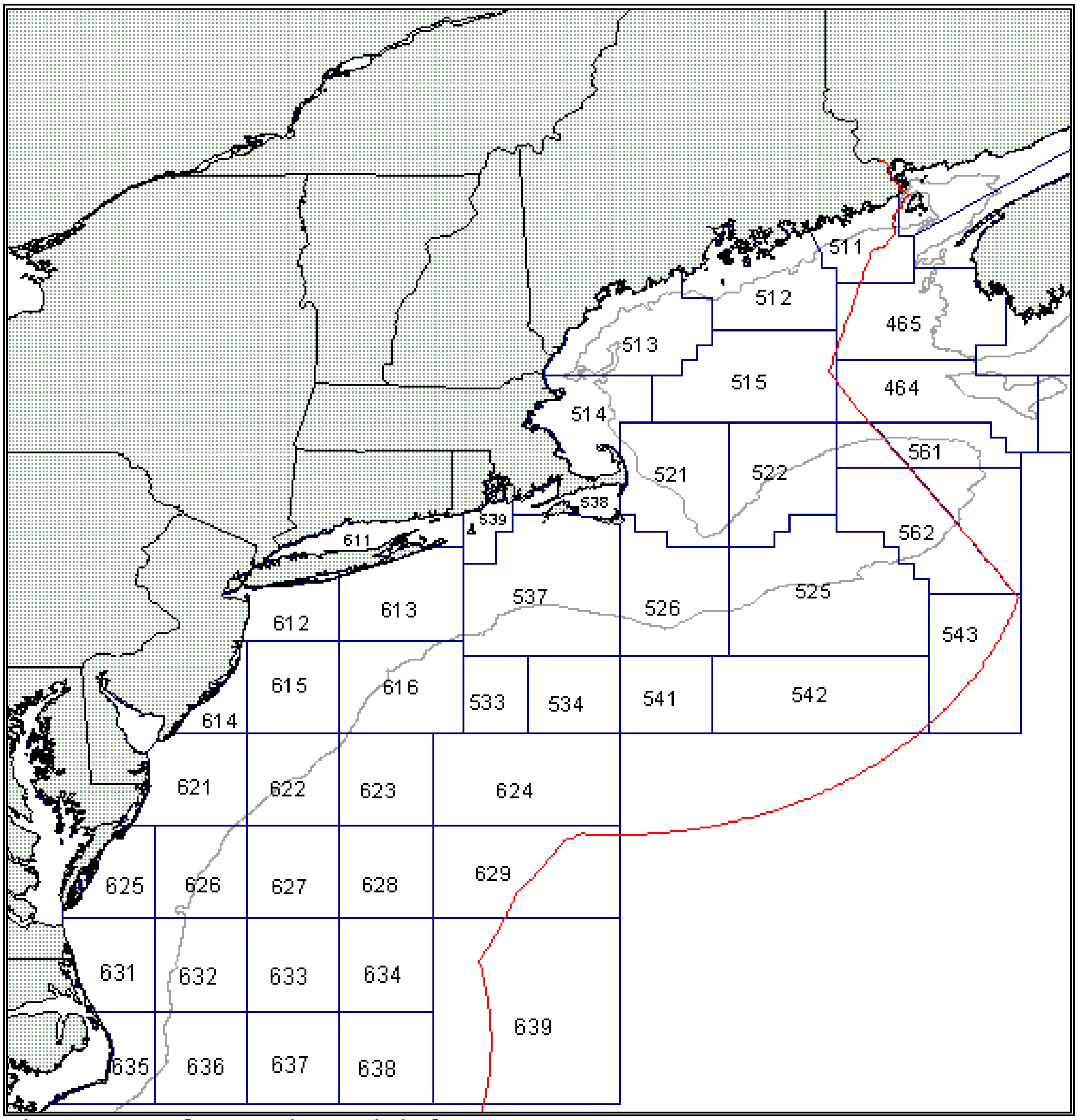


Figure 8 – Northeast region statistical areas

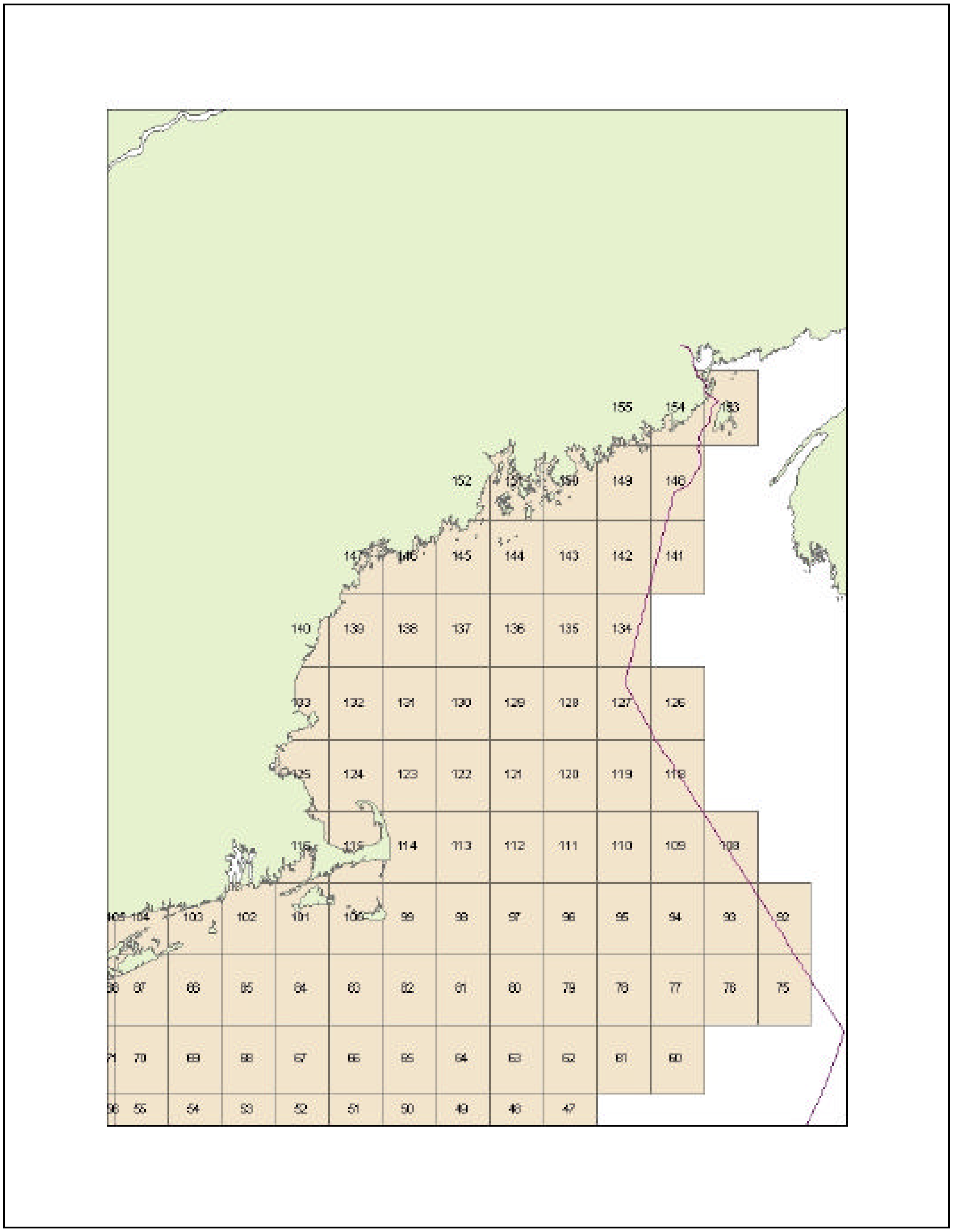


Figure 9 – Thirty minute squares used to describe management areas

3.6.1 Commercial Fishery Management Measures

This proposal adopts management measures to achieve a mix of adaptive and phased reduction rebuilding strategies. In addition, it develops opportunities for fishing on stocks that do not need reductions in fishing mortality. As described in section 3.2, these measures are designed to meet the phased reduction rebuilding strategy for GB cod, CC/GOM yellowtail flounder, SNE/MA yellowtail flounder, American plaice, and white hake. For all other stocks that require a formal rebuilding program, it is designed to achieve the adaptive rebuilding strategy.

The proposed action was developed in response to comments received from the public on the Amendment 13 SEIS, developed through the efforts of the Northeast Seafood Coalition. The action combines several elements contained in the draft:

- The action is designed to achieve a combination of rebuilding trajectories, rather than one trajectory
- The action builds on the categorization of effective effort by defining opportunities for using B DAS
- It addresses a recognized weakness of the initial alternatives - the impact of restrictive measures on catches of stocks in good condition – by creating opportunities to fish on healthy stocks using B DAS.

3.6.1.1 Effort Controls

3.6.1.1.1 DAS Allocations

The DAS reserve program (see section 3.5.3) will be used to categorize DAS into Categories A, B, and C and to define effective effort. The effective effort for each permit will be divided into Category A and Category B DAS according to the following formula:

Category A: 60 percent of effective effort as defined by section 3.5.3
Category B: 40 percent of effective effort as defined by section 3.5.3
Category C: FY 2001 allocation (not including carry-over) less section 3.5.3effective effort

In addition, Category B DAS will be sub-divided:

B(regular) DAS: 20 percent of effective effort as defined by section 3.5.3
B(reserve) DAS: 20 percent of effective effort as defined by section 3.5.3

Example (1): For a fleet DAS permit (88 DAS allocated in FY 2001), that qualifies for 88 days of effective effort under the criteria and qualification period of section 3.5.3:

Option 9 effective effort:		88 DAS
Category A DAS:	60 percent of 88 DAS =	52.8 DAS
Category B (regular) DAS:	20 percent of 88 DAS =	17.6 DAS
Category B (reserve) DAS:	20 percent of 88 DAS =	17.6 DAS
Category C DAS:	88 - 88 =	0 DAS

Example (2): For a fleet DAS permit (88 DAS allocated in FY 2001), that qualifies for 50 days of effective effort under the criteria and qualification period of section 3.5.3:

Option 9 effective effort:		50 DAS
Category A DAS:	60 percent of 50 DAS =	30 DAS
Category B (regular) DAS:	20 percent of 50 DAS =	10 DAS
Category B (reserve) DAS:	20 percent of 50 DAS =	10 DAS
Category C DAS:	88 – 50 =	38 DAS

<u>Rationale</u>: The primary tool for controlling fishing mortality will be through the use of limits on DAS – the time available to be fished. This proposal refines the use of a blunt effort control by limiting the number of DAS that can be fished on any stock, but providing opportunities to use DAS to fish on healthy stocks. The limits on Category A DAS will reduce the number of DAS that are allocate and can be fished on any stock from about 71,000 in fishing year 2003 to about 41,000 in fishing year 2004. Actual DAS use in 2003 is expected to be about 50,000 DAS, and actual use in fishing year 2004 will likely be in the range of 31,000

to 35,000 DAS. This is over a forty percent reduction in fishing effort compared to the fishing year 200/2001 average.

3.6.1.1.2 DAS Use

On implementation of Amendment 13, a vessel can use Category A DAS subject to the management measures listed in following sections. Category A DAS can also be used in an approved Special Access Program.

- Category B DAS can be used to target stocks that do not need a reduction in fishing mortality subject to the following conditions.
  - A vessel must declare its intent to use a Category B DAS at the start of a trip.
  - In addition to restrictions on gear, closed areas, etc. listed below, vessels on a B (regular) day will be subject to stringent trip limits for stocks of concern. These restrictions will be defined in a future management action. Until those restrictions are defined, B (regular) DAS can only be used in an approved Special Access Program.
  - B (reserve) DAS can only be used in an approved Special Access Program
- A vessel can only use a "regular" Category B DAS if it has an equal amount of unused Category A DAS remaining for that fishing year. The number of remaining **regular** Category B DAS eligible for use can not exceed the amount of Category A DAS **remaining** for an individual permit
- If the vessel exceeds the stringent trip limits for a stock of concern, the operator can change the designation of the trip to a Category A DAS trip and retain the possession limit for that species that is authorized under a Category A DAS. This is referred to as "flipping" a DAS. A vessel cannot "flip" a B regular DAS if fishing in an approved Special Access Program.

The following Special Access Programs will be developed:

- Georges Bank Yellowtail Flounder in CA II (see section 3.4.5.3.1)
- Georges Bank Haddock in Closed Area II (see section 3.4.5.3.3)
- Georges Bank Haddock in Closed Area I (see section 3.4.5.3.4)
- Gulf of Maine haddock in the WGOM Closed Area (to be developed)
- Cashes Ledge Closed Area (to be developed)

Rationale: By creating opportunities for the use of Category B DAS, this measure may help direct effort onto healthy stocks. This will help to mitigate the economic impacts of the restrictions on the use of Category A DAS. Once conditions are specified for the use of Category B (regular) DAS,

3.6.1.1.3 Re-classification of DAS

As stocks recover, there may be opportunities to increase the number of available Category A DAS. All Category B DAS will be converted to Category A DAS before any Category C DAS are converted to Category A DAS. If necessary to achieve rebuilding targets, Category A DAS may be changed to Category B (regular) DAS.

Rationale: This measure creates a mechanism to shift effort to stocks that can support additional fishing pressure – either as a result of successful rebuilding efforts, or to facilitate additional rebuilding. The restriction on Category C DAS is to provide active participants the ability to return to fishing at 1996 through 2001 levels before other fishermen are allowed to target groundfish.

3.6.1.2 Management Measures

All management measures adopted by the negotiated settlement agreement among certain parties as implemented August 1, 2003 are maintained unless changed (see following sections) . These measures are not repeated here, but can be found in 50 CFR 648 Subpart F.

3.6.1.3 Closed Areas

3.6.1.3.1 Year Round Closed Areas

The current Closed Area I, Closed Area II, Western Gulf of Maine, Cashes Ledge, and Nantucket Lightship Closed Areas will be continued as year round closed areas. See section 3.7.3 for additional areas that are prohibited to mobile bottom tending gear in order to minimize to the extent practicable the adverse effects of fishing activity on essential fish habitat.

Rationale: The existing year round closed areas have proven beneficial to the rebuilding of several stocks. Parts of these areas also provide important habitat benefits. The year round Cashes Ledge closed area was not in place in fishing year 2001. This closed area should help expand the range of cod in the GOM.

3.6.1.3.2 Seasonal Closed Areas

The seasonal closed areas are:

March:	121, 122, 123
April:	121-125; 129-133;
May:	124- 125; 129-133; 136-140; 80 – 81; 98-99; 109-114; 118-120 south of 42°20'N
June:	132-133; 139-140; 141-147; 152
October:	124-125
November:	124-125

Rationale: This measures reduces the number of months that seasonal closed areas are in effect, while expanding the GB closed area during the month of May. This will provide additional protection to GB cod. Reducing the number of months of closures in the GOM will help provide more opportunities for fishermen to effectively use their limited number of available DAS.

3.6.1.4 Possession Limits

Category A DAS

GOM cod: 800 lbs/DAS / 4,000 lbs/trip.

GB cod: 1,000 lbs/DAS/10,000 lbs/trip for trawl and gillnet vessels

For hook vessels:

- July 1 – September 15: Jig and commercial longline directed cod season. 2,000 lbs limit. No groundfish landings on Friday and Saturday.
- September 16 – December 31: Restricted cod season. 600 lbs/DAS
- January through March: Jig and demersal longline fishing. 2,000 lbs
- April, May, June: no jig or demersal longline groundfish fishing on Georges Bank
- In order to use this seasonal hook gear trip limit, vessels must make an annual declaration for using hook gear.

CC/GOM yellowtail flounder: April/May and October/November : 250 pound possession limit
June 1 – September 30 and December 1 – March 31: 750 lbs. per DAS/3,000 lbs. per trip possession limit

SNE/MA yellowtail flounder: March 1 – June 30: 250 pound possession limit;
June 1 – February 28: 750 lbs. per DAS/ 3,000 lbs per trip possession limit

Category B (regular) DAS
To be developed through a future framework action.

Rationale: The increase in the GOM cod trip limit will reduce regulatory discards of this stock and make each DAS more profitable for fishermen. It may also help reduce fishing effort on plaice, yellowtail flounder, and other flatfish, as fishermen may not harvest those stocks in as large a quantity because of the revenue generated from GOM cod. The GB cod trip limit reduction helps reduce mortality on this stock, and has been selected so as to minimize the possibility that it will increase regulatory discards. The yellowtail flounder trip limits are adopted to reduce mortality on these two stocks. They are seasonal in order to shift effort away from aggregations of flounders.

3.6.1.5 Gear Restrictions

The gear restrictions implemented August 1, 2002 are continued with the following modifications (see Table 27 for details)

- Changes to the number of gillnets that can be used by trip gillnet vessels on Georges Bank
- Changes to the number of gillnets in the SNE/MA area
- Changes in restrictions on the use of gillnets in the GOM

Rationale: This action continues many of the gear restrictions adopted under the FW 33 settlement agreement. Compared to the regulations in place in FY 2001, there is an overall increase in mesh size for both trawl and gillnet gear. This is intended to change the selection pattern of the fishery to target larger fish, providing more opportunities for fish to spawn before being selected by the fishery. The number of gillnets that can be fished are also reduced, both to limit effort/mortality on stocks targeted by these fisheries and to reduce the likelihood that the trip limits will result in discards from this sector. Compared to the FW 33 settlement agreement, the number of trip gillnets allowed in both the GOM and GB are the same, removing what some perceived as an unfair, unwarranted restriction. The minimum hook size and requirement to use a circle hook are intended to both reduce the catch of small fish and improve their survivability in the hook fishery. Limits on the number of hooks are intended to reduce overall effort by the hook fishery.

3.6.1.6 Minimum Fish Sizes

The minimum fish sizes implemented August 1, 2002 are retained (cod minimum size increased to 22 inches) (see below).

Species	Size (Inches, Total Length)
Cod	22 (55.9 cm)
Haddock	19 (48.3 cm)
Pollock	19 (48.3 cm)
Witch flounder (gray sole)	14 (35.6 cm)
Yellowtail flounder	13 (33.0 cm)
American plaice (dab)	14 (35.6 cm)
Atlantic halibut	36 (91.4 cm)
Winter flounder (blackback)	12 (30.5 cm)
Redfish	9 (22.9 cm)

Rationale: Compared to the no action alternative, this proposal will adopt and increased minimum size for cod. This is to provide additional protection to rebuilding cod stocks, particularly on GB.

3.6.1.7 Default Measures

The combined rebuilding strategy proposed requires that fishing mortality for several stocks decline in future years, according to the schedule shown in Table 10. Default measures are defined in order to accomplish these reductions. The default measures are designed to reduce mortality on specific stocks, though in some instances they can be expected to reduce mortality for other stocks as well. Unless they are modified by a future Council action, the default measures shown in the following table (Table 13) will be implemented unless:

(1) The targeted stock(s) is(are) projected to be at the target biomass with at least a median probability in the year the measures are to be implemented and overfishing is not occurring on those stocks, or
(2) Biomass estimates show rebuilding is on track and the best available estimate of the fishing mortality rate for the targeted stock(s) meets the fishing mortality rate for the rebuilding program as specified in Table 10, or
(3) Overfishing is not occurring and the best available estimate of the fishing mortality rate for the targeted stock(s) is projected to rebuild the stock with at least a median probability by the end of the rebuilding period.

In addition to the above three conditions for the stocks targeted by the default measure, all other stocks must meet the fishing mortality rates specified in Table 10 for the default measures to be deferred.

Fishing Year Implemented	Stocks Targeted	Default Measure
2006	American Plaice SNE/MA Yellowtail Flounder	DAS Category A/B ratio: 55/45 Differential DAS counting in the SNE/MA RMA at a rate of 1.5:1
2009	GB Cod GOM Cod CC/GOM Yellowtail Flounder SNE/MA Yellowtail Flounder American Plaice White Hake SNE/MA Winter Flounder	DAS Category A/B Ratio: 45/55

Table 13 – Proposed default measures to meet rebuilding program fishing mortality rates

Rationale: The proposed measures implement a combination of adaptive and phased rebuilding strategies. These strategies call for reductions in fishing mortality in future years. Default measures are included in the amendment that target the necessary reductions. These defaults are based on the use of DAS as the primary mortality control. The change in the categorization of DAS will reduce the number of DAS that can be fished on stocks that need reduced mortality. It may be possible to identify other measures that will be as effective, but these will need to be adopted in a future Council action.

3.6.1.8 VMS Requirements

There is no VMS requirement automatically implemented by this alternative. The current call-in system and voluntary VMS will be maintained. Section 3.4.14.2 describes changes to vessel reporting requirements that will be adopted by this amendment.

	GOM	GB	SNE	Mid-Atl
MINIMUM MESH SIZE RESTRICTIONS FOR GILLNET GEAR				
NE Multispecies Day Gillnet Category*	Roundfish nets 6.5" (16.5 cm) mesh; 50-net allowance	All nets 6.5" (16.5 cm) mesh; 50-net allowance	All nets 6.5" (16.5 cm) mesh; 75-net allowance	Roundfish nets 6.5" (16.5 cm) mesh; 75-net allowance
	Flatfish nets 6.5" (16.5 cm) mesh; 100-net allowance			Flatfish nets 6.5" (16.5 cm) mesh; 75-net allowance
NE Multispecies Trip Gillnet Category*	All nets 6.5" (16.5 cm) mesh; 150-net allowance	All nets 6.5" (16.5 cm) mesh; 150-net allowance	All nets 6.5" (16.5 cm) mesh; 75-net allowance	All gillnet gear 6.5" (16.5 cm) mesh; 75-net allowance
Monkfish Vessels**	10" (25.4 cm) mesh/150-net allowance			
MINIMUM MESH SIZE RESTRICTIONS FOR TRAWL GEAR				
Codend only mesh size*	6.5" (16.5 cm) diamond or square		7.0" (17.8 cm) diamond or 6.5" (16.5 cm) square	6.5" (16.5 cm) diamond or square
Large Mesh Category - entire net	8.5" (21.59 cm) diamond or square			7.5" (19.0 cm) diamond or 8.0" (20.3 cm) square
MAXIUM NUMBER OF HOOKS AND SIZE RESTRICTIONS FOR HOOK-GEAR* **				
Limited access multispecies vessels	2,000 hooks	3,600 hooks	2,000 hooks	4,500 hooks (Hook-gear vessels only)
	No less than 6" (15.2 cm) spacing allowed between the fairlead rollers			
	12/0 circle hooks required for longline gear			N/A

* When fishing under a NE multispecies DAS
** Monkfish Category C and D vessels when fishing under a monkfish DAS
*** When fishing under a NE multispecies DAS or when fishing under the Small-vessel permit

Table 14 – Proposed gear requirements

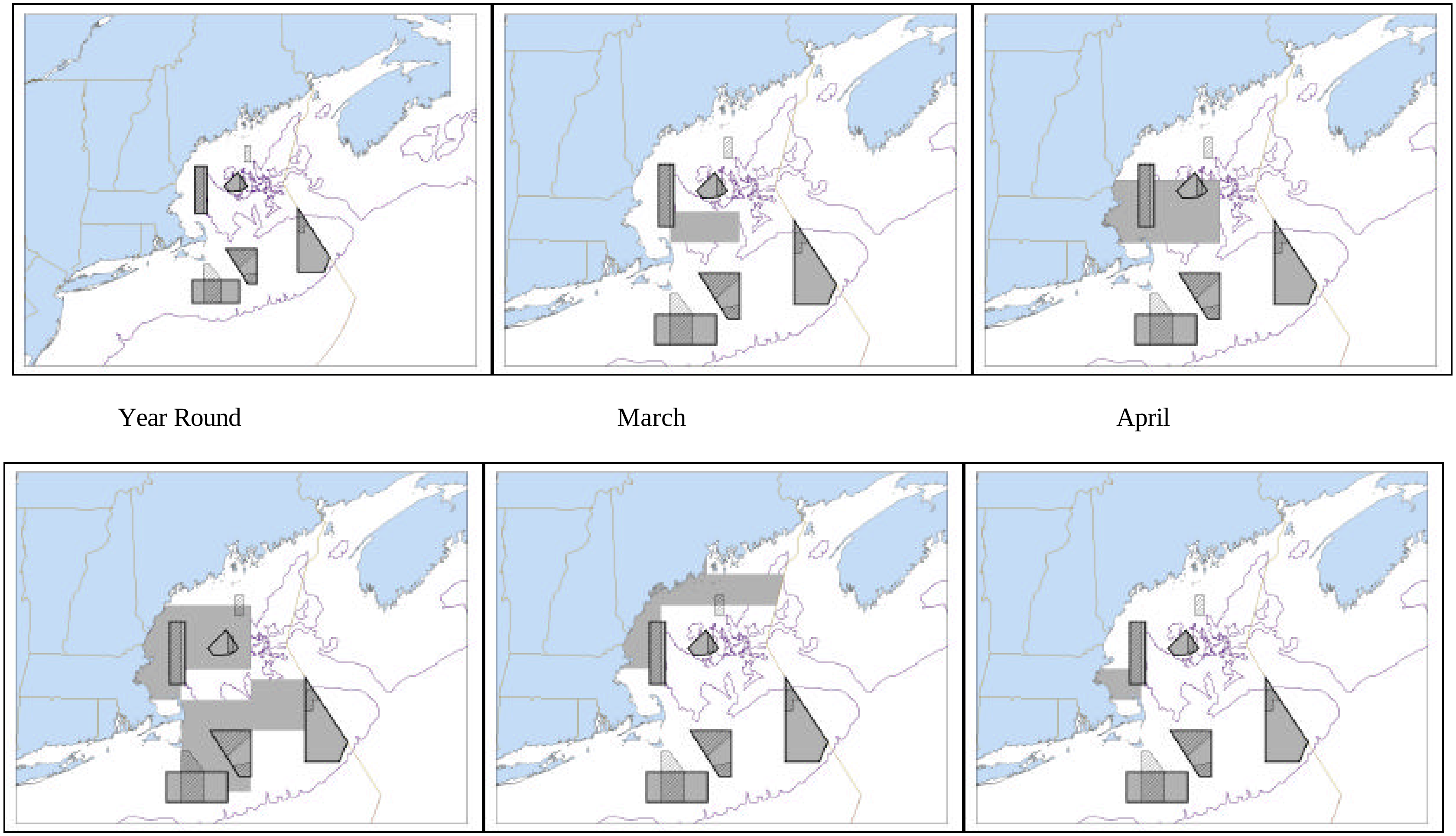


Figure 10 – Proposed action year round and seasonal closed areas. Level 3 habitat areas are cross hatched.

3.6.2 Recreational Fishery Management Measures

Bag limit for all private recreational vessels:	10 cod/person day
Bag limit for party/charter vessels fishing in the Gulf of Maine:	10 cod/person/day

(Note there is no bag limit for haddock).

For the purposes of recreational and party/charter fishing vessels, any trip in excess of 15 hours **and** covering two consecutive calendar days will be considered more than one day. A similar standard will be applied to longer trips (i.e. a trip in excess of thirty-nine hours and covering three consecutive calendar days will be considered more than two days).

Minimum cod size:	22 inches
Minimum haddock size:	19 inches

All other measures in place during fishing year 2001 continue to apply.

Rationale: These proposed measures are designed to reduce recreational harvest of GOM cod by imposing a bag limit on party/charter fishing in the Gulf of Maine. As discussed in section 9.4.3, this sector is a major component of this fishery that under the no action alternative was not subject to any limit on the number of cod caught. By imposing a bag limit, this sector will contribute to rebuilding GOM cod. At the same time, the limit is set at a level which will allow these vessels to attract passengers and remain in business. Recreational fishermen will no longer be subject to a bag limit for haddock. The M-S Act requires that all sectors share in the benefits of stock recovery. The removal of the bag limit for haddock will enable recreational fishing vessels to benefit from the rebuilding of this stock.

3.6.2.1 Possible Modifications

Significant changes in the fishing mortality reduction for GOM cod could result in changes to the recreational fishing measures.

3.7 Alternatives to Minimize the Adverse Effects of Fishing on Essential Fish Habitat

The 1996 Amendments to the MSA require that FMPs minimize, to the extent practicable, adverse effects on EFH caused by fishing (MSA section 303(a)(7)). Additionally, based on the federal court order regarding the National Environmental Policy Act (NEPA) requirements of the Council's Omnibus EFH Amendment (AOC v. Daley, September 14, 2000), the following is a list of proposed habitat-related management measures, which are included in the supplemental environmental impact statement (SEIS) prepared for Amendment 13 to the Multispecies FMP. The actions included in this amendment represent some of those received by NMFS and the Council during scoping for Amendment 13, as well as other alternatives developed in an effort to assist the Council comply with the AOC v. Daley court order.

3.7.1 Benefits to Essential Fish Habitat of Other Amendment 13 Alternatives (Alternative 2)

Some of the non-habitat-related management measures in Amendment 13 are likely to provide benefits to essential fish habitat in the region. This alternative will rely on the habitat benefits of other non-habitat management measures that are implemented in Amendment 13 to meet the EFH provisions of the MSA. Depending on which measures are adopted, those benefits may or may not satisfy the EFH provisions of the MSA. Table 15 summarizes the expected habitat benefits of the proposed non-habitat management measures that are being considered by the Council in Amendment 13.

3.7.2 Expand list of gears prohibited in closed areas (Alternative 7)

This alternative will expand the list of fishing gears prohibited from use in the year-round closed areas to include clam dredges. This gear is allowed in portions of the existing groundfish closed areas and, due to their impacts, excluding their use may better protect essential fish habitat.

Alternative	Overall Habitat Impact	Feature	Description of Habitat Impact
US/Canada Resource Sharing Agreement	Negative Impact (-)	Adoption of understanding with hard TACs for cod, haddock, and yellowtail flounder with incentives for participation	This area is primarily sand and gravelly sand. About half of this relatively small access area is deep undisturbed bottom with a high cover of emergent epifauna (Collie et al., 2000).
Observer Coverage	Indirect benefits (+)	10% requested by 2006 for each gear type	If observers are able to collect data of interest to EFH management, increased coverage could indirectly benefit habitat.
Alternatives to Control Capacity	Positive Impact (+)	DAS can be transferred with restrictions and new measures for "reserve days"	Any measure that is intended to reduce the amount of time fishing by mobile gear will likely have benefits to EFH. These measures reduce amount of latent effort as well.
Management Measures to Address Rebuilding Requirements	Overall Positive Impact (+)	Mix of adaptive and phased reduction strategies. Provides opportunity to fish on stocks that do not need rebuilding	The effort reductions, year-round closed areas, and existing gear modifications are likely to have positive impacts on EFH.
Effort Controls	Positive Impact (+)	A days (60% of effective effort) B days (40% of effective effort) C days (FY01 allocation)	Reducing DAS will likely benefit EFH by reducing the amount of time vessels can fish. There are studies that document the recovery of benthic habitats following the cessation of bottom fishing.
Closed Areas	Positive Impact (+)	Addition of Cashes as a year round closure	Year-round closures provide habitat benefits to the areas within the closures. The addition of Cashes Ledge as a year-round closure will benefit the EFH and rare kelp beds found in that area.

Table 15 – Summary of the potential habitat benefits of non-habitat measures proposed in Amendment 13.
Note: Seasonal (rolling) closures, possession limits, and hard TACs that are included in a number of proposed management measures are not considered to provide any significant habitat benefits. Habitat benefits identified above apply primarily to bottom trawls, not to fixed gear such as hooks and gill nets

3.7.3 Habitat Alternative 10, Option (b) – Compromise Habitat Closure Areas

The Council selected Habitat Alternative 10, Option (b) to implement under Amendment 13 to the Northeast Multispecies FMP to minimize the adverse impacts of fishing as demonstrated in the Adverse Impact Determination section.

This action identifies several areas as habitat closures. These areas are a Level III habitat closure, with one exception, shrimp trawls are allowed in the WGOM closed area (see the description of Levels for habitat closures in Section 3.7.4). This alternative was developed to incorporate areas that would benefit EFH, but not in the most productive fishing grounds currently available to fishermen. Both existing mortality closures and proposed habitat closures were modified to develop one alternative that closes sensitive habitat. It is important to note that these modifications are for habitat closures only; none of the habitat alternatives adjust boundaries of groundfish mortality closed areas. In general, the alternatives suggest changing the eastern boundary of the Western Gulf of Maine closure for habitat purposes, and modifying the Nantucket Lightship closure for habitat purposes. In addition, the access areas used in

Framework 13 for Closed Area I were modified slightly as habitat closed areas. Lastly, the habitat closure proposals for Closed Area II, Jeffrey's, Bank, and Cashes Ledge were included in this alternative, with some modifications.

These modifications were suggested for different reasons. Specifically, the boundaries within Closed Area I for the FW13 access program were modified to protect better spawning grounds for Cod (open area shifted to the South). The proposed habitat closure for the Western Gulf of Maine (in Alternatives 3a, 3b, and 4) was modified to include the complex bottom that is found along the western border of the closure. The areas on Cashes Ledge and Jeffrey's Ledge that have been proposed for habitat closures in Habitat Alternatives 3a, 3b, and 4 were recommended as well, with a modification to the southern boundary of the Cashes habitat closure. This recommendation was primarily for enforcement reasons, and this area is deeper, so does not contain the rare kelp beds that are contained on Cashes Ledge. The modification to the Nantucket Lightship closure was recommended to include more complex bottom and small fish that are found north of the existing boundaries, rather than the areas in the western and eastern portion of the closure. Overall, the main intent of this alternative is to protect EFH through long term closed areas, but at the same time it recognizes that access to primary fishing grounds is important as well.

Detailed justification of each closed area modification:

<u>Closed Area I (CAI)</u> - According to industry, Closed Area I is very beneficial for rebuilding haddock and may be the primary reason haddock are recovering today. However, CAI does not provide much benefit for cod. Much of CAI is sand, however, there are diverse sediment types scattered within the area. The southeastern portion of CAI was contains the much of the complex bottom in the closed area. The northern part of the Framework 13 scallop access area in the middle of CAI has important habitat for cod spawning. As such, the Framework 13 scallop access area was shifted southward so that the cod could gain protection in the north for spawning, and the scallop resource would be accessible in the closed area. Both option (a) and (b) include the modified version of the Closed Area I as a habitat closure.

<u>Closed Area II (CAII)</u> – The habitat closed area was defined as the boundaries of the existing cod HAPC. From Amendment 11 to the Northeast Multispecies FMP, the following justification was provided for the designation of the existing cod HAPC:

"Several sources document the importance of gravel/cobble substrate to the survival of newly settled juvenile cod (Lough et al. 1989; Valentine and Lough 1991; Gotceitas and Brown 1993; Tupper and Boutilier 1995; Valentine and Schmuck 1995). A substrate of gravel or cobble allows sufficient space for newly settled juvenile cod to find shelter and avoid predation (Lough et al. 1989; Valentine and Lough 1991; Gotceitas and Brown 1993; Tupper and Boutilier 1995; Valentine and Schmuck 1995). Particular life history stages or transitions are sometimes considered "ecological bottlenecks" if there are extremely high levels of mortality associated with the life history stage or transition. Extremely high mortality rates attendant to post-settlement juvenile cod are attributed to high levels of predation (Tupper and Boutilier 1995). Increasing the availability of suitable habitat for post-settlement juvenile cod could ease the bottleneck, increasing juvenile survivorship and recruitment into the fishery. For these reasons, areas with a gravel/cobble substrate meet the first criterion for habitat areas of particular concern.

Specific areas on the northern edge of Georges Bank have been extensively studied and identified as important areas for the survival of juvenile cod (Lough et al. 1989; Valentine and Lough 1991; Valentine and Schmuck 1995). These studies provide reliable information on the location of the areas most important to juvenile cod and the type of substrate found in those areas. These areas have also been studied to determine the effects of bottom fishing on the benthic megafauna (Collie et al. 1996; Collie et al. 1997). Gravel/cobble substrates not subject to fishing pressure support thick colonies of emergent epifauna, but bottom fishing, especially scallop dredging, reduces habitat complexity and removes much *of the emergent epifauna (Collie et al. 1996; Collie et al. 1997). Acknowledging that a single tow of a dredge across pristine habitat will have few long-term effects, Collie et al. (1997) focus on the cumulative effects and intensity of trawling and dredging as responsible for potential long-term changes in benthic communities. For these reasons, the identified area on the northern edge of Georges Bank meets the second criterion, as well as the cumulative effects consideration, for designation as a habitat area of particular concern.*

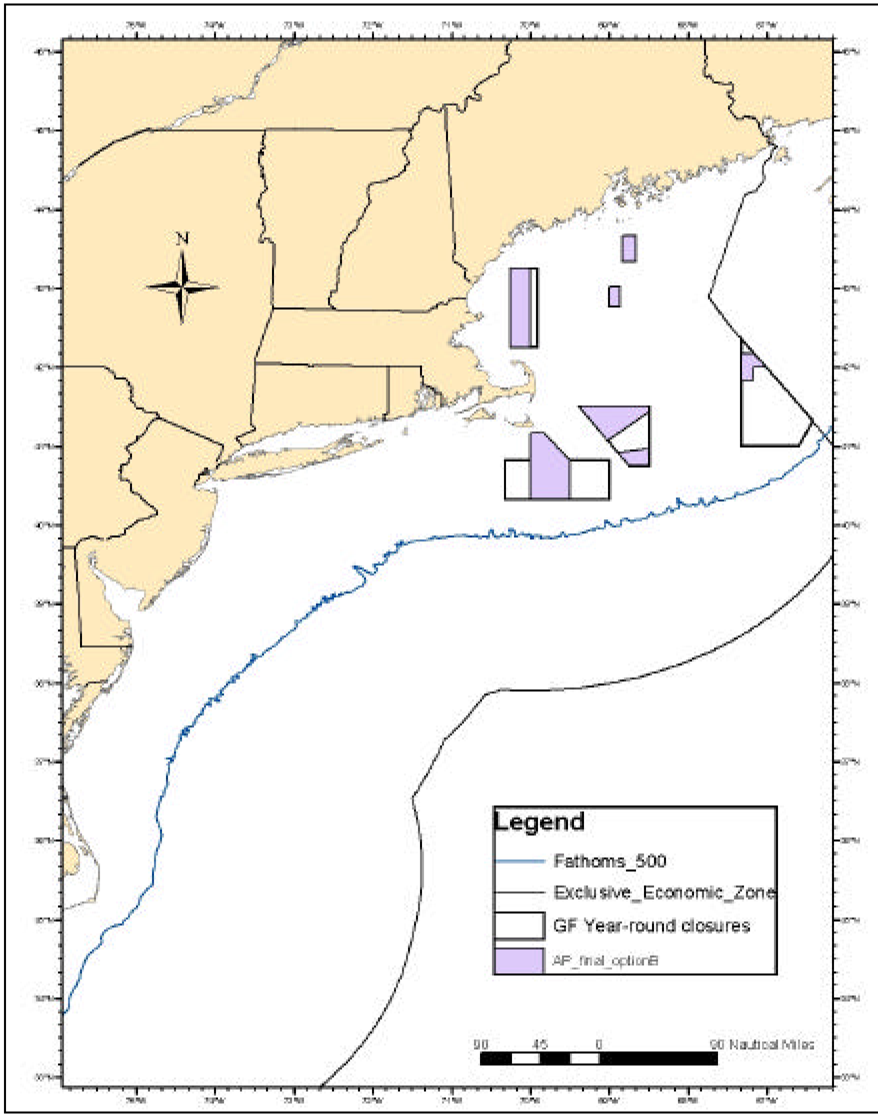
Collie et al. (1997) also describe the relative abundance of several other species such as shrimps, polychaetes, brittle stars, and mussels in the undisturbed sites. These species are found in association with the emergent epifauna (bryozoans, hydroids, worm tubes) prevalent in the undisturbed areas. Several studies of the food habits of juvenile cod identify these associated species as important prey items (Hacunda 1981; Lilly and Parsons 1991; Witman and Sebens 1992; Casas and Paz 1994; NEFSC 1998). These areas provide two important ecological functions for post-settlement juvenile cod relative to other areas: increased survivability and readily available prey. These areas are also particularly vulnerable to adverse impacts from mobile fishing gear."

Western Gulf of Maine Closed Area (WGOM) **-** The new boundaries proposed in some of the habitat alternatives seem hard to enforce, and the industry would not gain much from the areas that would open. Modify the proposed habitat closure for the WGOM by the eastern boundary to come straight down the 70°W line instead of the irregular boundary proposed in habitat alternatives 3a, 3b, and 4. The main rationale behind this modification is that the closed area would be easier to enforce and there are resources in the eastern portion of the closure that should be available to fishermen. Furthermore, the important areas for habitat are along the western boundary. If all the deep areas are closed to fishing then there is no where to go to avoid cod bycatch. It was also pointed out that this area is close to Gloucester, and this port depends on this area heavily. Both option (a) and (b) include the modified version of the WGOM as a habitat closure. The shrimp season has been short in recent years: 1998-1999 (40 DAS), 2000-2001 (61 DAS), 2001-2002 (25 DAS), 2002-2003 (38 DAS). Therefore, the extent and duration of the impact to EFH from shrimp trawling is minimal.

Nantucket Lightship Closed Area (NLCA) **-** Anecdotally, the substrate in the Nantucket Shoals is very complex. As such, this area has diverse sediment types and is important for the protection of small fish. An extension of the area north of the Nantucket Lightship would be closed primarily to protect the habitats on which small fish depend. A benthos map completed roughly in the 1960s showed that most of the concentrations of benthos in this area were contained in the central portion of the Nantucket Lightship area. Although this area is mostly sand, it contains many species. The modifications to include the central portion and an extension to the north contain a diversity of sediments and species. Both option (a) and (b) include the modified version of the NLCA as a habitat closure.

Cashes Ledge Closed Area - the closure should be modified to the 42°45W line. The southern boundary should be moved up, because the deeper area to the south does not contain kelp and should be assessable for fishing. Both option (a) and (b) include the modified version of the Cashes Ledge Closure as a habitat closure.

Jeffreys Ledge Closed Area - Both option (a) and (b) include the version contained in Alternative 3 (a) and (b) of the Jeffrey's Ledge Closed Area as a habitat closure.



Coordinates for 10b				
	Longitude (Deg, Min)		Latitude (Deg, Min)	
Closed Area II	67	20	42	10
	67	9.3	42	10
	67	0.5	42	0
	67	10	42	0
	67	10	41	50
	67	20	41	50
WGOM	70	15	43	15
	70	0	43	15
	70	0	42	15
	70	15	42	15
Cashes	69	3.22	43	1.14
	68	51.56	43	1.14
	68	51.56	42	45
	69	3.22	42	45
Jeffreys	68	50	43	40
	68	40	43	40
	68	40	43	20
	68	50	43	20
Nantucket	70	0	41	10
	69	50	41	10
	69	30	40	50
	69	30	40	20
	70	0	40	20
Closed Area I	69	22.8	41	30
	68	30	41	30
	68	30	41	26
	69	1	41	4
Closed Area I	68	53	40	55
	68	30	40	58
	68	30	40	45
	68	45	40	45

Figure 11 Proposed habitat closures (Alternative 10b)

3.7.4 Options for Levels of Habitat Area Closure

Four levels of Habitat Closures were approved by the Council as a basis for determining appropriate gear types for habitat closure areas. These levels apply to the closed area alternatives that follow. It is possible that a closure level could be applied to all closed areas, or that closure levels be assigned specifically to each habitat closed area. Bottom tending mobile gear is defined as the following gears: hydraulic clam dredges, quahog dredge, scallop dredge, otter trawls (shrimp, scallop, fish, crab), beam trawls, sea urchin dredges and Danish/Scottish seines. Bottom tending static gear is defined as the following gears: lobster pots, fish pots, crab pots, sink and stake gillnets, and bottom longlines.

Level 1 Habitat Closure: The area will be closed indefinitely on a year round basis to all fishing gear.

This is the most restrictive option. This level would essentially establish a no-take marine protected area and would prohibit the use of all types of fishing gear in these closures. This level of closure would close the area to all fishing gear, both commercial and recreational.

Level 2 Habitat Closure: The area will be closed indefinitely on a year round basis to all bottom tending gear (static and mobile).

This option is slightly less restrictive than the Level 1 closure because it allows non-bottom-tending gear to operate in the habitat closures. Because is does prohibit all bottom tending gear, it will protect EFH for benthic species and life stages to the same degree as a Level 1 closure. The differences between Level 1 and Level 2 closures are primarily social and economic. Refer to Section **9.3.1.2** for a discussion of the impacts of both mobile and static gear on benthic habitats.

Level 3 Habitat Closure: The area will be closed indefinitely on a year round basis to all bottom tending mobile gear.

This level of closure is less restrictive because it allows static bottom tending gear to operate in these closures, but prohibits bottom tending mobile gears. Although less restrictive than Levels 1 and 2, the effects of this level of closure on benthic habitats do not differ significantly from the effects of Level 1 or 2 closures since static gear is generally considered to have minimal adverse impacts on benthic habitat (see section **9.3.1.2**).

Level 4 Habitat Closure: The area will be open indefinitely on a year round basis only to gear defined as "reduced impact" gear.

Currently there are no reduced impact gear types defined by the Council. The identification of "reduced impact gear" would begin by first defining the ecological function served by the closure, with the advice from the Habitat Technical Team.

The analysis of this option is difficult because it requires knowledge of the individual ecological functions or features that the Council intends to protect. It is feasible that a Level 4 closure could apply to subsets of habitat closures depending on the intention of the closure. The implementation of this option will require a scientific and technical review procedure that includes, at a minimum, the Habitat Committee and the EFH Technical Team. If this level of closure is recommended, a process similar to the Council's HAPC designation process (See the Council's Habitat Annual Review and Report of 2000 for details) is recommended.

Summary of Level of Closures:

Because the effects of fishing on benthic habitats are caused primarily by mobile bottom-tending gears (bottom trawls and dredges), much less so by static bottom-tending gear (*e.g.*, pots, bottom longlines and gill nets), and not at all by pelagic gears (*e.g.*, mid-water trawls), the habitat metric analyses performed in this amendment/DEIS would apply equally well to Level 1 and Level 2 closures and nearly as well to Level 3 closures. Analysis of Level 4 closures would have to be tailored to the effects of specific "reduced impact" gears on specific habitat types. Economic and social impact assessments that were performed as part of the Practicability Analysis (Section 5.6), as well as assessments of enforcement feasibility and cumulative impacts were conducted for Level 1 and Level 3 closures in order to better distinguish between the impacts of these two closure levels.

None of the proposed habitat closures in this amendment specify which gear types would be prohibited. The Council will make those determinations when it decides whether an area closure is needed in order to minimize the adverse impacts of groundfish fishing on EFH. In implementing a habitat closed area alternative, the Council could prohibit the use of mobile, bottom-tending gear types while allowing the use of pelagic gears (Level 2) or pelagic and fixed bottom-tending gear (Level 3) based on practicability issues. If future closure alternatives are proposed for reasons other than the minimization of fishing impacts identified in this document (e.g. research areas, coral protection, etc.), other closure levels may be appropriate.

3.8 Other Issues

3.8.1 Elimination of the Area Restriction for the Northern Shrimp Fishery

The northern shrimp fishery will no longer be restricted to the area shoreward of the small mesh fishery exemption line by the Northeast Multispecies FMP. All other restrictions (for example, the requirement to use a Nordmore grate, restrictions on incidental catch, prohibition on fishing in some year round closed areas, etc.) remain in effect. The small mesh fishery exemption line will be retained in the regulations because it is used for other reasons, but it will no longer apply to the northern shrimp fishery.

Small Mesh Northern Shrimp Fishery Exemption Area

Point	N. Lat.	W. Long.
SM1	41º 35’	70º 00’
SM2	41º 35’	69º 40’
SM3	42º 49.5’	69º 40’
SM4	43º 12’	69º 00’
SM5	43º 41’	68º 00’
G2	43º 58’	67º 22’; (the U.S.-Canada maritime Boundary).
G1	Northward along the irregular U.S.-Canada maritime boundary to the shoreline.	

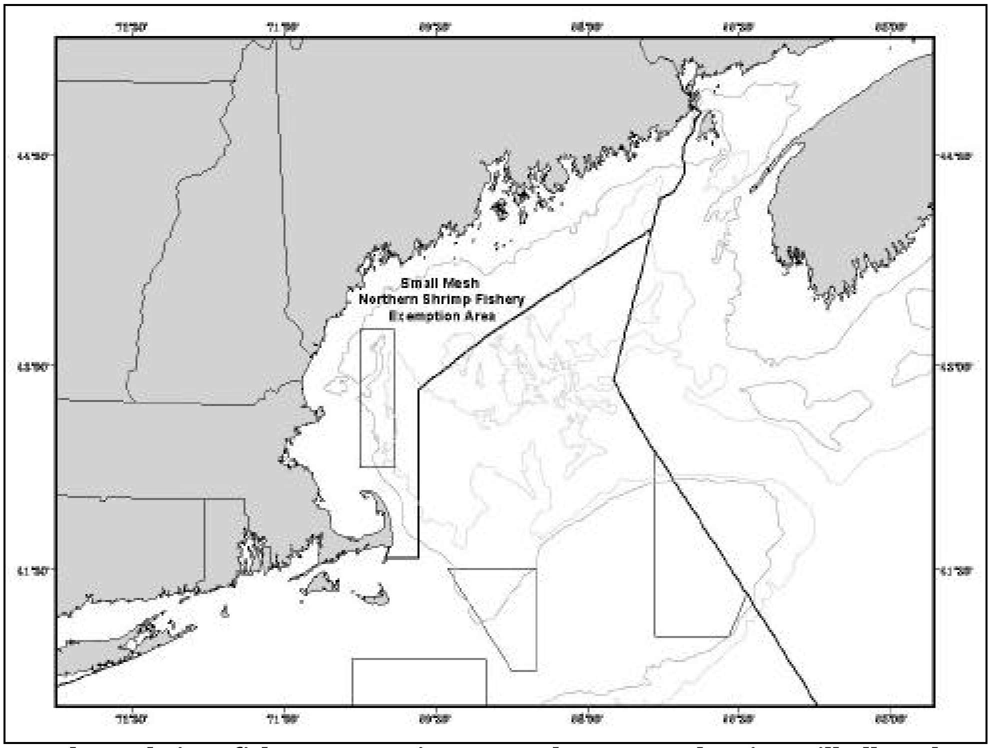


Figure 12 – Northern shrimp fishery exemption area. The proposed action will allow the northern shrimp fishery to take place in all areas.

Discussion: Based on the results of an experimental fishery conducted by the Maine Department of Marine Resources, this option expands the area authorized for the northern shrimp fishery. It provides increased opportunities for shrimp fishermen, while reflecting the results of the experiment that demonstrate that the fishery will not increase the bycatch of regulated groundfish to an unacceptable level. This option removes area restrictions for this fishery that are imposed because of concerns over regulated groundfish bycatch.

3.8.2 Tuna Purse Seine Vessel Access to Groundfish Closed Areas

Tuna purse seine gear is defined as an exempted gear for the purposes of the Northeast Multispecies FMP. Tuna purse seine vessels will be allowed into all groundfish closed areas, subject only to the normal restrictions for using an exempted gear in the area.

- Fishing for, landing or retaining all multispecies (including non-regulated and small mesh multispecies) is prohibited.
- Vessels may not have on board gear capable of catching multispecies.
- Vessels may not fish in the Closed Area II Habitat Area of Particular Concern (HAPC).
- If the Regional Administrator determines that tuna purse seine vessels are adversely affecting habitat or groundfish stocks, individual vessels, or all vessels, may be prohibited from a closed area or areas.

Rationale: This action provides the greatest flexibility to tuna purse seine vessels with minimal restrictions. The Council recognizes that part of a purse seine net uses mesh smaller than the current groundfish regulated mesh size and presumably could retain groundfish, creating an apparent conflict with the prohibition of having gear on board capable of catching multispecies. Purse seine gear, however, is defined as exempted gear under the multispecies regulations and therefore this part of the net is not to be construed as a reason for prohibiting the use of purse seine gear in the closed areas.

3.8.3 SNE General Category Scallop Vessel Exemption Program

Unless otherwise prohibited in §50 CFR 648.81, vessels with a limited access scallop permit that have declared out of the DAS program as specified in §50 CFR 648.10, or that have used up their DAS allocations, and vessels issued a general scallop permit, may fish in the statistical areas 537, 538, 539, and 613 – defined as the Southern New England General Category Scallop Exemption Area - when not under a NE multispecies DAS, providing the vessel complies with the requirements specified below.

- A vessel fishing in the area (defined above) may not fish for, possess on board, or land any species of fish other than Atlantic sea scallops.
- The combined dredge width in use by or in possession on board vessels fishing in the SNE General Category Scallop Vessel Exemption Area shall not exceed 10.5 ft (3.2 m), measured at the widest point in the bail of the dredge.
- Dredges must use a minimum of an eight-inch twine top to minimize groundfish bycatch.
- The exemption does not apply to the Nantucket Lightship Closed Area unless specifically authorized access through the Groundfish FMP.

Rationale: This proposal removes a groundfish plan restriction that prevented general category scallop vessels from fishing in this area because of concerns over groundfish bycatch. This proposed action does not affect any measures adopted in the Scallop FMP to manage this fishery, with the exception of limiting dredge size and twine tops.

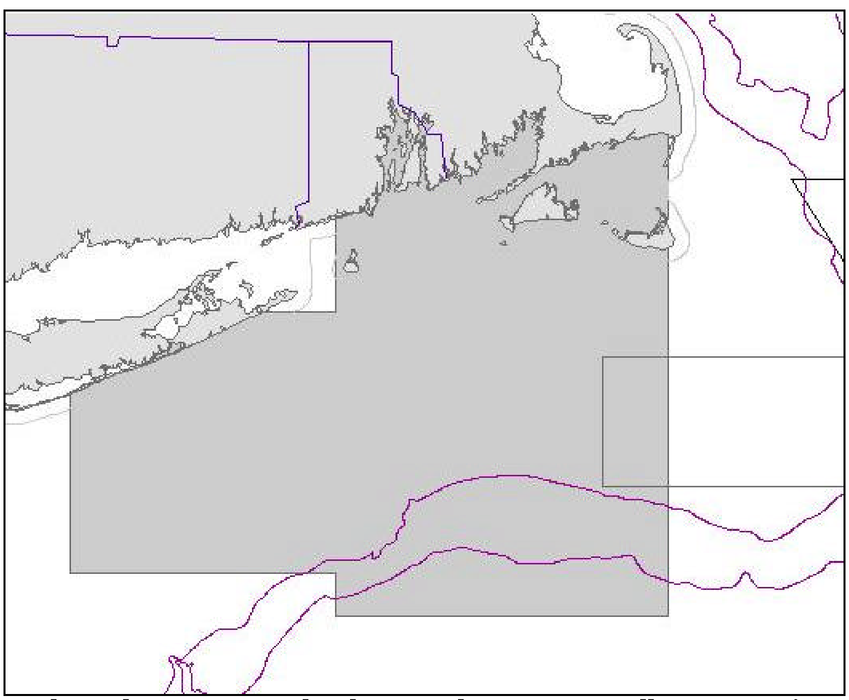


Figure 13 – Proposed Southern New England General Category Scallop Exemption Area

4.0 Alternatives to the Proposed Action

4.1 Alternatives Not Selected

4.1.1 Clarification of Stock Status, Status Determination Criteria, and MSY Control Rules

As described in section 3.1, this amendment will clarify the criteria used to evaluate stock status and the biological targets used to manage the fishery. The Council considered a number of options for these issues. The non-selected alternatives are described below.

4.1.1.1 When is a stock overfished?

The "No Action" alternative defined a stock as "overfished" when it is less than the biomass target., consistent with some interpretations of Amendment 9. This option was not selected because it conflicts with NSG1. In addition, it would be administratively burdensome because it would trigger a requirement for a formal rebuilding program whenever stock size fluctuated below the target.

4.1.1.2 When is overfishing occurring?

The No Action alternative defined "overfishing" consistent with Amendment 9: it occurs when the fishing mortality rate exceeds the threshold fishing mortality that is specified for a given stock biomass. The Council did not select this alternative because it conflicts with NS1

4.1.1.3 Status Determination Criteria

Option 1, the No Action alternative, proposed to retain the status determination criteria specified in Amendment 9. This option would have retained mean biomass targets for most stocks, as well as biomass-weighted fishing mortality for most stocks (see Table 16). In addition, it would have retained minimum biomass thresholds of less than ½ the target biomass for several stocks. The Council did not select this alternative because of the inconsistencies between assessment information and the status determination criteria. In addition, several of the minimum biomass thresholds were not consistent with NSG1.

Stock	Biomass Target	Minimum Biomass Threshold	Fishing Mortality Threshold	Fishing Mortality Target
GOM Cod	SSB_{MSY}	¼ Btarget	F_{MSY}	75% of F_{MSY}
GB Cod	SSB_{MSY}	¼ Btarget	F_{MSY}	75% of F_{MSY}
GB Haddock	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
GOM Haddock	B_{MSY} Proxy/Fall Trawl Survey Index	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
GB Yellowtail Flounder	SSB_{MSY}	¼ Btarget	F_{MSY}	75% of F_{MSY}
Cape Cod/GOM Yellowtail Flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
SNE/MA yellowtail flounder	SSB_{MSY}	¼ Btarget	F_{MSY}	75% of F_{MSY}
American Plaice	SSB_{MSY}	¼ Btarget	F_{MSY}	75% of F_{MSY}
Witch Flounder	SSB_{MSY}	42% Btarget	F_{MSY}	75% of F_{MSY}
GOM Winter Flounder	SSB_{MSY}	½ Btarget	F_{MSY}	75% of F_{MSY}
GB Winter Flounder	B_{MSY}	½ Btarget	F_{MSY} (1)	75% of F_{MSY}
SNE/MA Winter Flounder	SSB_{MSY}	¼ Btarget	F_{MSY}	75% of F_{MSY}
Acadian Redfish	SSB_{MSY}	½ Btarget	F50% proxy for F_{MSY}	75% of F_{MSY}
White Hake	B_{MSY} Proxy/Fall Survey Index (> 60 cm fish)	¼ Btarget	F_{MSY} Proxy/Relative Exploitation Index (> 60 cm fish)	75% of F_{MSY}
Pollock	B_{MSY} Proxy/ Fall Survey Index	¼ Btarget	F_{MSY} Proxy/ Relative Exploitation Index	75% of F_{MSY}
Windowpane Flounder (North)	B_{MSY} Proxy/Fall Survey Index	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
Windowpane Flounder (South)	B_{MSY} Proxy/Fall Survey Index	¼ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
Ocean Pout	B_{MSY} Proxy/Fall Survey Index	½ Btarget	F_{MSY} Proxy/Relative Exploitation Index	75% of F_{MSY}
Atlantic Halibut	B_{MSY}	½ Btarget	F_{MSY} (1)	75% of F_{MSY}

Table 16 - Option 1 for status determination criteria parameters for groundfish stocks.

Fully recruited fishing mortality unless otherwise noted. See text for calculation of B_{MSY} proxy based on trawl survey index, and F_{MSY} proxy based on exploitation index.

(1) Biomass weighted fishing mortality

4.1.1.4 Numerical Estimates

Three alternatives to the proposed action were considered for the numerical estimates of status determination criteria.

No Action

Status determination criteria would have been as defined in Amendment 9. Retaining these estimates would not have been consistent with revising the parameters, and would not have been consistent with recent scientific work on status determination criteria for these stocks.

Option 2 – Step Increase
This alternative, described below, would have increased biomass targets from the Amendment 9 values to the values recommended by NEFSC 2002b in a series of steps. This alternative was not selected for several reasons. First, it was not considered consistent with the M-S Act requirement to use the best available science. Second, the increase was evaluated as arbitrary, with no scientific basis.

In developing this alternative, the Council considered NEFSC 2002A, the advice of the SSC and the peer review. NSGs require the Council use the "best available scientific information available" in crafting management plans. The NSGs do **not** instruct the Council to use the *most recent* scientific information. The NSGs and the M-S Act provide little guidance on the determination of what is the "best available science," but the NSGs do explicitly recognize that the Council may have to judge what information meets this standard: "If there are conflicting facts or opinions relevant to a particular point, a Council may choose among them, but should justify the choice." The Council is faced with conflicting guidance on the biological reference points because the reference points resulting from the methodological approach of Applegate et al. (1997) conflict with those in NEFSC 2002A. Because of this conflict and the NSG guidance, it is reasonable and consistent with the M-S Act and the NSGs for the Council to exercise its judgment in adopting status determination criteria.

With respect to the reference points proposed in NEFSC 2002A, the Council notes the following:

- NEFSC 2002a contains several caveats on the recruitment assumptions that are used to generate the biomass target estimates. For example, the report says: "It is possible that these stocks (e.g. Georges Bank cod) cannot meet long-term targets without recruitment that will rarely occur even if fishing is stopped." For Southern New England Yellowtail Flounder, the authors note: "The largest recruitment in this period (e.g. the past ten years) was 16.4 million fish, which under no fishing would only produce 45,500 mt of spawning biomass in equilibrium."
- The report does not fully explore the ecosystem implications of the high biomass targets. Some information is presented that suggests stocks can co-exist at biomasses higher than current levels. No information is presented, however, that shows stocks can co-exist at the very high B_{MSY} levels presented in the report. Such conditions have not been documented.
- The report estimated MSY for individual stocks rather than on a multispecies basis. It includes only a brief discussion of the ability of the ecosystem to support all stocks at these estimates of MSY at the same time. Some scientists argue that a multispecies MSY will be lower than the combined sum of the MSYs determined on a single species basis (Link 2002; Brown et al. 1976). If this is accurate, it may not be possible for the ecosystem to support all of the single species MSY values for all stocks at the same time
- The report did not provide any guidance on target fishing mortality or MSY control rules. As a result, the Council must rely on either Restrepo et al. (1997) or Applegate et al. (1998) for the technical basis for these parameters. Because NEFSC (2002) did not report the distribution F_{MSY} estimates, the percentile approach of Applegate et al. (1998) is not consistent with F_{MSY} estimates.
- Section 302 of the M-S Act requires that when a Council determines it appropriate to consider new information from a state or federal agency, interested parties shall have a reasonable opportunity to respond to new data or information before the Council takes final action on conservation and management measures. This report was the product of nearly a month of work by nineteen scientists who have devoted careers to population dynamics issues. It is impossible for the public to mount a similar short-term effort in order to develop an informed opinion of the

results. Given the complex technical issues involved in preparing NEFSC 2002a, it is reasonable to allow an extended period for interested parties a chance to review and respond to the report.

- The adaptive approach recommended in NEFSC 2002a would adopt the biomass targets and alter them if future information indicates they are in error. (Note this is not the same adaptive rebuilding strategy approach proposed in section 3.2.3.1.2). While this approach to biomass targets may make sense from a biological standpoint, it does not take into account M-S Act requirements to balance biological, social, and economic objectives. The economic and social analysis in this document (sections 5.4 and 5.6) clearly demonstrate significant impacts on fishermen and coastal ports as a result of management measures designed to achieve the proposed biomass targets. In particular, the short-term impacts show large declines in fishing vessel revenues compared to the No Action alternative can be expected in the initial years of the rebuilding programs. Break-even analysis in section 5.4.5 shows that many vessels will not earn enough groundfish revenues to cover costs. While the choice of rebuilding period and rebuilding strategy can affect these impacts, basing management measures on strategies designed to achieve biomass targets that ultimately prove unattainable may have severe, irreversible impacts on communities and the public that rely on commercial and recreational fishing.
- The Council's SSC, a panel of independent, highly qualified fisheries scientists, did not give the Council a clear statement recommending immediate implementation of the status determination criteria in NEFSC 2002a.
- Some members of the peer review stated unequivocally that "…a pragmatic solution to covering the substantial uncertainty in estimates of B_{MSY}, where for example they fall outside the largest observed value in the historical time series, could be to set them at a value closer to the range of actual observations." (Payne et al 2003)

While these points give the Council some concern for immediately adopting the recommendations of NEFSC 2002a, the advice of the SSC that the report is useful cannot be ignored. Thus, the dilemma facing the Council is that there is no clear understanding that NEFSC 2002a is the "best scientific information available," but the report does provide evidence that groundfish stocks are significantly more productive than previously assumed. Because the methodology of NEFSC 2002a differs from Applegate et al. (1998), the numerical estimates of the new reference points cannot just be viewed as an update of the earlier information. As a result, the Council must use its discretion (authorized by the NSGs) to choose between the conflicting information it has been presented. NOAA Fisheries notified the Council on March 17, 2003, that these biological targets may not be consistent with the National Standard Guidelines.

Action: The Council proposed an adaptive approach to the numerical estimates of the biological reference points recommended by NEFSC 2002a. (It should be noted this approach differs from the form of an adaptive approach suggested in NEFSC 2002a). Consistent with the report's recommendation to reduce fishing mortality, the Council is adopting the recommended numerical estimates of threshold fishing mortality. With respect to the biomass targets, the Council acknowledges that the report indicates that groundfish stocks appear to be more productive than assumed under earlier modeling efforts and there is considerable potential for stock increases and increased catches. If lower biomass targets (based on Applegate et al. 1998) continue to be used to guide management actions, the Council will forfeit an opportunity to increase stock biomass and yields. However, because of the uncertainties previously noted, the Council will not immediately adopt the recommended biomass targets but instead will gradually increase to them in a series of steps. In the absence of any guidance on an appropriate level of increase, the previous reference points will be increased by twenty-five percent. If over time the stock increases to this new reference point, the biomass target will be increased another twenty-five percent. This process will be repeated for each stock until either the new biomass target is reached or updated information suggests a different target. For some stocks, this approach immediately adopts the numerical estimates recommended by NEFSC 2002a. For Georges Bank yellowtail flounder, the stock has already increased to the first interim target so the target is increased to the second step. Minimum biomass thresholds will be based on these target biomasses (see section 3.1.6). The target biomass will be used to determine stock status and compliance with M-S Act rebuilding requirements. The target biomass and fishing mortality thresholds are shown in Table 17.

It should be clear that if the NEFSC 2002a numerical estimates are correct, and management measures successfully control fishing mortality this adaptive approach will result in biomass targets that steadily increase to either the NEFSC 2002a estimates or some value re-estimated in the future. This will, however, be a planned and predictable change. The growth in stock size will be determined by periodic assessments, and interested parties will be able to anticipate when the biomass targets will be shifted.

The Council will adopt the numerical estimates of threshold fishing mortality rates recommended by NEFSC 2002a. For target fishing mortality rates, the Council will adopt the approach of Restrepo et al. (1996). Target fishing mortality rates will be set at 75 percent of the threshold fishing mortality rate. The setting of the target fishing mortality rate is in part a function of the precision of an assessment's fishing mortality estimate. Target mortality rates may be changed on a stock-by-stock basis as recommended by an assessment, and will be incorporated through the periodic adjustment process.

Status determination criteria were not determined for Gulf of Maine winter flounder in NEFSC 2002a because the stock did not have a current assessment. The proposed reference points are those recommended by SAW 36 (NEFSC 2003).

Additional information: NOAA Fisheries notified the Council on March 17, 2003, that these biological targets may not be consistent with the National Standard Guidelines.

Stock	Biomass target (Bmsy or proxy)			Fishing Mortality Threshold (Fmsy)		Basis for Reference Points
	Current	NEFSC 2002a Recommended	Proposed	Current	NEFSC 2002a Recommended/ Proposed	
Gulf of Maine Cod	22,100[1]	82,800	27,625	0.27[4]	0.23	Parametric S-R
Georges Bank Cod	83,500[1]	216,800	104,375	0.32[4]	0.18	Parametric S-R
Georges Bank Haddock	105,000	250,300	131,250	0.26	0.26 (F40%)	Empirical Non-parametric
Gulf of Maine Haddock	8.25 kg/tow	22.17 kg/tow	10.3 kg/tow	0.29 (C/I)	0.23 (C/I)	Catch-Survey Proxy
Georges Bank Yellowtail Flounder	35,200[1]	58,800	55,000	0.33[4]	0.25 (F40%)	Empirical Non-parametric
Southern New England/Mid-Atlantic Yellowtail Flounder	36,600 (SNE YTF only)	69,500	45,750	0.23[4]	0.267 (F40%)	Empirical Non-parametric
Cape Cod/GOM Yellowtail Flounder	4,200[1] (CC YTF)	12,600	5,250	0.40[4]	0.17 (F40%)	Empirical Non-Parametric (mean)
American Plaice	24,200	28,600	28,600	0.19	0.17 (F40%)	Empirical Non-parametric (mean)
Witch Flounder	21,800[1]	25,240 (SAW 37)	25,240	0.106[4]	0.23 (F40%)	Empirical Non-Parametric (mean)

Table 17 – Summary of Amendment 9, recommended (NEFSC 2002a) and proposed biomass and fishing mortality rate reference points for New England groundfish stocks.

All recommended and proposed biomass targets are in spawning stock biomass units or trawl survey indices unless otherwise noted. All recommended fishing mortality thresholds are in fully-recruited fishing mortality unless otherwise noted.

1. Biomass target established based on total biomass; value shown is SSB equivalent, metric tons
2. Total biomass, metric tons
3. Unit is total stock biomass for fish >= 60 cm., mt
4. Unit is biomass weighted F

Stock	Biomass target (Bmsy)			Fishing Mortality Threshold (Fmsy)		Basis for Reference Points
	Current	NEFSC 2002a Recommended	Proposed	Current	NEFSC 2002a/ Proposed	
Southern New England Winter Flounder	11,800[1]	30,100	14,750	0.37[4]	0.32	Parametric S-R
Georges Bank Winter Flounder	2.49 kg/tow	9,400[2]	9,400[2]	1.21 (C/I)	0.32[4]	Surplus Production
GOM Winter Flounder	NA	NA	4,100	NA	0.43	Parametric S-R
Acadian Redfish	108,000[1]	236,700	135,000	0.116[4]	0.04 (F50%)	Empirical Non-Parametric (mean upper Q)
White Hake[5]	14,700	14,700 [3]	14,700/ 7.70 kg/tow	0.29[4]	0.29[4/] 0.55 C/I	Surplus Production
Pollock	102,000	3.0 kg/tow	3.0 kg/tow	0.65[1]	5.88 (C/I)	Catch-Survey proxy
N. Windowpane	0.94 kg/tow	0.94 kg/tow	0.94 kg/tow	1.11 (C/I)	1.11 (C/I)	Catch-Survey proxy
S. Windowpane	0.41 kg/tow	0.92 kg/tow	0.51 kg/tow	2.24 (C/I)	0.98 (C/I)	Catch-Survey Proxy
Ocean Pout	4.9 kg/tow	4.9 kg/tow	4.9 kg/tow	0.31 (C/I)	0.31 (C/I)	Catch-Survey Proxy
Atlantic Halibut	5,400[2]	5,400[2]	5,400	0.06	0.06	Catch-YPR proxy

Table 17 (cont.) – Summary of Amendment 9, recommended (NEFSC 2002a) and proposed biomass and fishing mortality rate reference points for New England groundfish stocks.

1. Biomass target established based on total biomass; value shown is SSB equivalent, metric tons
2. Total biomass, metric tons
3. Unit is total stock biomass for fish >= 60 cm., mt
4. Unit is biomass weighted F
5. Survey based equivalents from GARM 2002

Option 3 – "High 3" Biomass Targets
For the same reasons described in Option 2, the Council considered a third alternative to the proposed action. This alternative was not selected for several reasons. First, it was not considered consistent with the M-S Act requirement to use the best available science. Second, the use of the highest three observed biomasses, or the value recommended by NEFSC 20021 (whichever is lower) was evaluated as arbitrary, with no scientific basis.

<u>Action</u>: The Council will follow the advice in peer review reports to establish biomass targets set closer to the range of observed values. The biomass target will either be determined by the average of the highest three observed biomasses, or the value recommended by NEFSC 2002a, whichever is lower. Fishing mortality thresholds are established at the level recommended by NEFSC 2002a. Values are shown in Table 18.

Stock	Biomass target (Bmsy or proxy)			Fishing Mortality Threshold (Fmsy)		Basis for Reference Points
	Amend-ment 9	NEFSC 2002a Recommended	Proposed "High Three"	Proposed	NEFSC 2002a Recommended/ Proposed	
Gulf of Maine Cod	22,100[1]	82,800	77,500	0.27[4]	0.23	Parametric S-R
Georges Bank Cod	83,500[1]	216,800	188,900	0.32[4]	0.18	Parametric S-R
Georges Bank Haddock	105,000	250,300	168,700	0.26	0.26 (F40%)	Empirical Non-parametric
Gulf of Maine Haddock	8.25 kg/tow	22.17 kg/tow	22.17 kg/tow	0.29 (C/I)	0.23 (C/I)	Catch-Survey Proxy
Georges Bank Yellowtail Flounder	35,200[1]	58,800	39,300	0.33[4]	0.25 (F40%)	Empirical Non-parametric
Southern New England/Mid-Atlantic Yellowtail Flounder	36,600 (SNE YTF only)	69,500	69,500	0.23[4]	0.267 (F40%)	Empirical Non-parametric
Cape Cod/GOM Yellowtail Flounder	4,200[1] (CC YTF)	12,600	2,000	0.40[4]	0.17 (F40%)	Empirical Non-Parametric (mean)
American Plaice	24,200	28,600	19,900	0.19	0.17 (F40%)	Empirical Non-parametric (mean)
Witch Flounder	21,800[1]	19,900	19,900	0.106[4]	0.23 (F40%)	Empirical Non-Parametric (mean)

Table 18 – "High 3": summary of Amendment 9, recommended (NEFSC 2002a) and proposed ("high 3") biomass and fishing mortality rate reference points for New England groundfish stocks.

All recommended and proposed biomass targets are in spawning stock biomass units or trawl survey indices unless otherwise noted. All recommended fishing mortality thresholds are in fully-recruited fishing mortality unless otherwise noted.

1. Biomass target established based on total biomass; value shown is SSB equivalent, metric tons
2. Total biomass, metric tons
3. Unit is total stock biomass for fish >= 60 cm., mt
4. Unit is biomass weighted F

Stock	Biomass target (Bmsy)			Fishing Mortality Threshold (Fmsy)		Basis for Reference Points
	Current	NEFSC 2002a Recommended	Proposed "High Three"	Current	NEFSC 2002a/ Proposed	
Southern New England Winter Flounder	11,800[1]	30,100	30,100	0.37[4]	0.32	Parametric S-R
Georges Bank Winter Flounder	2.49 kg/tow	9,400[2]	9,400	1.21 (C/I)	0.32[4]	Surplus Production
GOM Winter Flounder	NA	NA	4,100	NA	0.43	Parametric S-R
Acadian Redfish	108,000[1]	236,700	129,100	0.116[4]	0.04 (F50%)	Empirical Non-Parametric (mean upper Q)
White Hake[5]	14,700	14,700 [3]	14,700/ 7.70 kg/tow	0.29[4]	0.29[4/] 0.55 C/I	Surplus Production
Pollock	102,000	3.0 kg/tow	3.0 kg/tow	0.65[1]	5.88 (C/I)	Catch-Survey proxy
N. Windowpane	0.94 kg/tow	0.94 kg/tow	0.94 kg/tow	1.11 (C/I)	1.11 (C/I)	Catch-Survey proxy
S. Windowpane	0.41 kg/tow	0.92 kg/tow	0.92 kg/tow	2.24 (C/I)	0.98 (C/I)	Catch-Survey Proxy
Ocean Pout	4.9 kg/tow	4.9 kg/tow	4.9 kg/tow	0.31 (C/I)	0.31 (C/I)	Catch-Survey Proxy
Atlantic Halibut	5,400[2]	5,400[2]	1.3 kg/tow	0.06	0.06	Catch-YPR proxy

Table 18 (cont.) – Summary of Amendment 9, recommended (NEFSC 2002a) and proposed biomass and fishing mortality rate reference points for New England groundfish stocks.

1. Biomass target established based on total biomass; value shown is SSB equivalent, metric tons
2. Total biomass, metric tons
3. Unit is total stock biomass for fish >= 60 cm., mt
4. Unit is biomass weighted F
5. Survey based equivalents from GARM 2002

4.1.1.5 MSY Control Rules

The Council considered using the threshold fishing mortality rates in Table 19 or Table 20 establish the criteria for determining when "overfishing" occurs. These thresholds change as a function of stock biomass. At a minimum, the Council will design management measures to meet the threshold fishing mortalities established by these control rules. If the fishing mortality for a stock exceeds the threshold for a given stock biomass, overfishing occurs. In this situation, the Council must take action within one year, with the purpose of ending overfishing. While action must be taken within one year, there is no specified time frame for ending overfishing and the Council may consider actions that will end overfishing as quickly as possible within a justifiable time period. To reduce the likelihood that fluctuations in fishing mortality will exceed this threshold and result in "overfishing," the Council will strive to achieve the fishing mortality targets as applied to the threshold for the current stock biomass. Optimum yield is defined in Amendment 9 as fishing at the target fishing mortality for the current biomass. Fishing mortality rates that exceed the thresholds defined in Table 19 or Table 20 over the long-term will not be consistent with the management plan and will require Council action because optimum yield is not being achieved.

This option reflects Amendment 9 language and could be considered the No Action alternative. NMFS, however, has not been applying this standard when making status determinations. It was not selected for this reason, and because it results in a cumbersome approach to overfishing that requires that the standard be continuously re-evaluated.

SPECIES	STOCK	MSY CONTROL RULE *Overfishing occurs when fishing mortality is above*:
COD	GB	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when $B_{threshold}$< B < ½ B_{msy}; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	GOM	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when $B_{threshold}$< B < ½ B_{msy}; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
HADDOCK	GB	F=0 when B < $B_{threshold}$; F that increases linearly from 0 at $B_{threshold}$ to F_{MSY} at B_{msy}
	GOM	F=0 when B< $B_{threshold}$; F calculated to rebuild in 5 years when $B_{threshold}$< B < B_{msy}
YELLOWTAIL FLOUNDER	GB	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when $B_{threshold}$< B < ½ B_{msy}; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	SNE	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when $B_{threshold}$< B < ½ B_{msy}; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	MID-Atl.	F=0 when B < $B_{threshold}$; F increases linearly from 0 at $B_{threshold}$ to F_{MSY} at B_{msy}
	Cape Cod	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when B < B_{msy}
AMERICAN PLAICE		F=0 when B < $B_{threshold}$; F that increases linearly from 0 at $B_{threshold}$ to F_{MSY} at B_{msy}
WITCH FLOUNDER		F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when ¼ B_{msy}< B < B_{target}
WINTER FLOUNDER	GB	F=0 when B < $B_{threshold}$; F increases linearly from 0 at $B_{threshold}$ to F_{MSY} at B_{target}
	GOM	F=0 when B < $B_{threshold;}$ F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	SNE/MA	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when $B_{threshold}$< B < ½ B_{msy}; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
REDFISH		F=0 when B < $B_{threshold}$; and an F that increases linearly from 0 at $B_{threshold}$ to F_{50}% at B_{msy}
WHITE HAKE		F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when $B_{threshold}$< B < ½ B_{msy}; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
POLLOCK		F=0 when B < $B_{threshold}$; and an F that increases linearly 0 at $B_{threshold}$ to F_{MSY} at B_{msy}
WINDOWPANE FLOUNDER	North	F=0 when B < $B_{threshold}$; F increases linearly from 0 at $B_{threshold}$ to F_{MSY} at B_{msy}
	South	F=0 when B < $B_{threshold}$; F increases linearly from 0 at $B_{threshold}$ to F_{MSY} at B_{msy}
OCEAN POUT		F=0 when B < $B_{threshold}$; F increases linearly from 0 at $B_{threshold}$ to F_{MSY} at B_{msy}
ATLANTIC HALIBUT		F=0 until stock is rebuilt (provisional control law)

Table 19 - Proposed MSY control rules under MSY control rule Alternative 2.

Minimum biomass of ¼ B_{MSY} or ½ B_{MSY} as adopted by Amendment 9.

SPECIES	STOCK	MSY CONTROL RULE *Overfishing occurs when fishing mortality is above***:**
COD	GB	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	GOM	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
HADDOCK	GB	F=0 when B < $B_{threshold}$; F that increases linearly from 0 at ½ B_{target} to F_{MSY} at B_{msy}
	GOM	F=0 when B< $B_{threshold}$; F calculated to rebuild in 5 years when $B_{threshold}$< B < B_{msy}
YELLOWTAIL FLOUNDER	GB	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	SNE	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	MID-Atl.	F=0 when B < $B_{threshold}$; F increases linearly from 0 at ½ B_{target} to F_{MSY} at B_{msy}
	Cape Cod	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when B < B_{msy}
AMERICAN PLAICE		F=0 when B < $B_{threshold}$; F that increases linearly from 0 at ½ B_{target} to F_{MSY} at B_{msy}
WITCH FLOUNDER		F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 5 years when ½ B_{msy}< B < B_{msy}
WINTER FLOUNDER	GB	F=0 when B < $B_{threshold}$; F increases linearly from 0 at ½ B_{target} to F_{MSY} at B_{msy}
	GOM	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
	SNE/MA	F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
REDFISH		F=0 when B < $B_{threshold}$; and an F that increases linearly from 0 at ½ B_{target} to $F_{50\%}$ at B_{msy}
WHITE HAKE		F=0 when B < $B_{threshold}$; F calculated to rebuild to B_{msy} in 10 years when ½ B_{msy}< B < B_{msy}
POLLOCK		F=0 when B < $B_{threshold}$; and an F that increases linearly from 0 at ½ B_{target} to F_{MSY}, at B_{msy}
WINDOWPANE FLOUNDER	North	F=0 when B < $B_{threshold}$; F increases linearly from 0 at ½ B_{target} to F_{MSY} at B_{msy}
	South	F=0 when B < $B_{threshold}$; F increases linearly from 0 at ½ B_{target} to F_{MSY} at B_{msy}
OCEAN POUT		F=0 when B < $B_{threshold}$; F increases linearly from 0 at ½ B_{target} to F_{MSY} at B_{msy}
ATLANTIC HALIBUT		F=0 until stock is rebuilt (provisional control law)

Table 20 - Proposed MSY control rules under MSY Control Rule Alternative 2 for interpreting control rules (incorporating increase in minimum biomass threshold to ½ BMSY)

4.1.2 Proposed Rebuilding Programs for Overfished Stocks

4.1.2.1 Rebuilding Timelines –Ending Date of 2009 for Most Stocks

In addition to the proposed action, the Council considered developing rebuilding programs to rebuild most overfished stocks with a median (50 percent) probability by 2009. According to NSG1, rebuilding periods begin when regulations are implemented for the rebuilding program. This action is planned for implementation on May 1, 2004. Amendment 9 implementing the original M-S Act overfishing definitions, however, was approved in 1999 and arguably should have included measures necessary to rebuild overfished stocks. Using that date as the starting date for rebuilding, and applying a ten year program, results in an ending date of 2009 for most stocks.

There were five exceptions to the 2014 end date: Georges Bank cod, Cape Cod/GOM yellowtail flounder, Acadian redfish, American plaice, and SNE/MA winter flounder. These stocks will have longer rebuilding periods. For GB cod, Cape Cod/GOM yellowtail flounder, and redfish, these stocks cannot rebuild in the absence of fishing mortality by 2009. This triggers longer rebuilding period for those stocks. Plaice and SNE/MA winter flounder were not overfished according to the Amendment 9 definitions. They will be overfished under the RPWG targets that may be adopted by this Amendment. Rebuilding plans for these stocks will begin May 1, 2004 and end in 2014.

This measure was not selected. It is not consistent with the NSGs, which say that formal rebuilding programs begin when measures are adopted for their implementation. Analysis showed that rebuilding programs ending in 2009 resulted in additional negative impacts on communities and the industry. Finally, the revision of biomass targets in NEFSC 2002b change the understanding of the biology of many groundfish stocks and warranted additional time for rebuilding.

4.1.2.2 Rebuilding Strategies - Constant Fishing Mortality Rate

Under this strategy, the fishing mortality is determined that, if held constant, will rebuild an overfished stock with at least a median probability in the appropriate time frame. When the stock achieves its target biomass, the formal rebuilding program adopted because the stock was overfished will be completed. Once the stock achieves the target biomass, fishing mortality targets will be based on the status determination criteria and MSY control rule. The appropriate fishing mortality will be based on observed stock conditions and recruitment. The fishing mortality for the rebuilding program may be adjusted if there are substantial changes in stock status and recruitment from those used in the long-term projections used to estimate this fishing mortality. Stock condition should be evaluated over at least a two year period to smooth fluctuations that are the result of variability rather than true trends. A wide variety of variables will be considered to determine stock condition: fishing mortality and biomass (including the uncertainty around the estimates), recruitment patterns, environmental conditions, etc.

Current estimates of the constant fishing mortality rate necessary to rebuild groundfish stocks by 2009 or 2014 are shown in Table 21 .

“Index” stocks or species typically lack sufficient age-based information to allow application of standard assessment models. For some species, the information content of the data does not support the estimation of reliable surplus production parameters. The index assessment methodology is described in detail in NEFSC 2002a. Underlying the methodology is a linear model of population growth which characterizes the population response to varying levels of fishing mortality. The model can be used to estimate the level of relative fishing mortality at which the population is likely to be stable. Fishing mortality rates greater than this value lead to population decline, values in excess lead to population increase. The magnitude of positive or negative population growth rates increases proportionately with relative fishing mortality rates below or above the stable value.

The index methodology can be extended to allow population projections under various scenarios. The basic approach can be summed up as follows. The population growth rate can be expressed as a linear function of the relative fishing mortality rate. The product of population growth rate and current population size projects the population to the next time step. Catch is estimated as the product of relative fishing mortality rate and the index population size. This sequence of computations is applied recursively to forecast population sizes up to the target biomass level (expressed in index units, e.g., kg/tow). Once the population attains the target level, relative fishing mortality is set at the level sufficient to keep the population size constant. The predicted catch when the population is at the target level serves as a proxy for the MSY.

This trajectory was not selected, in favor of a combination of the adaptive and phased strategies. In the initial years of rebuilding, the economic benefits of the other strategies are greater, mitigating the impacts of the amendment on fishing communities.

SPECIES	STOCK		Constant Fishing Mortality in order to:	
		Assumed F2002/2003	Rebuild most stocks by 2009	Rebuild most stocks by 2014
Cod	GB	0.45	0.18 (1)	0.18 (2)
	GOM	0.36	0.10	0.22
Haddock	GB	0.20	0.19	0.25
	GOM		0.20 (6)	0.22 (6)
Yellowtail Flounder	GB	0.14	0.15	0.23
	SNE/MA	0.74	0.06	0.18
	CC/GOM	0.95	0.08 (3)	0.09 (4)
American Plaice		0.26	N/A	0.15
Witch Flounder		No formal rebuilding program required		
Winter Flounder	GB	No formal rebuilding program required		
	GOM	No formal rebuilding program required		
	SNE/MA	0.45	N/A	0.25
Redfish		<0.01	0.01 (5)	0.01 (5)
White Hake		N/A	0.42 (6)	0.428 (6)
Pollock		No formal rebuilding program required		
Windowpane Flounder	North	No formal rebuilding program required		
	South	N/A	0.73 (6)	0.701 (6)
Ocean Pout		N/A	0.007 (6)	0.007 (6)
Atlantic Halibut	Insufficient information to calculate rebuilding mortality			

Table 21 – Constant fishing mortality rate rebuilding programs used for biomass target options 1 and 2

Notes:

(1) Based on 2024 rebuilding date
(2) Based on 2026 rebuilding date
(3) Based on 2014 rebuilding date
(4) Based on 2023 rebuilding date
(5) Based on 2051 rebuilding date
(6) Exploitation ratio

4.1.3 Fishery Program Administration

4.1.3.1 Fishing Year

Three additional options were considered for the groundfish fishing year. None were selected because any change would complicate implementation of this amendment. Because the fishing year was not changed, it was not necessary to consider either of the two sub-options for pro-rating DAS. The three options for a different fishing year are described in the following sections.

Calendar-based Fishing Year – January 1-December 31
The fishing year will begin on January 1 and end December 31.

FY JANUARY 1 - DECEMBER 31

March	April	May	June	July	August	September	October	November	December	January	February	March
Survey	Survey			Index	Age		WG	WG	SARC	SAW [	MMC	] →

April	May	June	July	August	September	October	November	December	January
	MMC report	1st FW meeting	2nd FW meeting	[submit to	NMFS]	proposed rule	comment period	final rule	effective

Discussion: This option sets the fishing year to match the calendar year. All annual adjustments would be expected to be implemented on January 1, and landings and fishing effort would be tracked according to the calendar year. Because current stock assessments are based on the calendar year this change would enable closer coordination between fishery (landings) and biological/stock data. Beginning the fishing year on January 1 would also minimize the gap between availability of the best scientific information and the implementation of the framework while maintaining a realistic schedule for administrative purposes. With this schedule, there are 21 months between the last month of the spring survey and the start of the fishing year, when framework measures take effect. A January 1 fishing year may help to more closely coordinate the management of transboundary stocks with Canada and/or other countries, since allocations for that agreement are based on a calendar year.

Starting the fishing year on January 1 may also allow fishermen to more effectively plan the use of their DAS. There will be less pressure early in the fishing year to rapidly use up new DAS, since winter months yield lower fishery productivity and more weather-related challenges. A January 1 start date may reduce the intense derby fishing that currently occurs in the beginning of the fishing year (May 1), with new DAS allocated during the most productive months of the fishery.

This change to the fishing year may create some administrative burden associated with annual permitting/FMP adjustments because it coincides with the start of the fishing year for some other regional fisheries. It may also pose some challenges to administrators in prorating DAS during the transition years. In general, a transition of this magnitude would require careful structure and planning, including a thorough reevaluation of the way in which scientific and fishery data is incorporated into the management process.

A change in the fishing year may also have allocation impacts if a quota or "hard" TAC system is adopted. Depending how the allocation is distributed in time (through the use of target TACs), some vessels may not have access to the allocation during the winter months because of vessel size and poor weather.

Fishing Year Beginning in October – October 1-September 30
The fishing year will begin on October 1 and end on September 30.

FY OCTOBER 1 - SEPTEMBER 30

September	October	November	December	January	February	March	April	May	June	July	August	September
Survey	Survey			Index	Age		WG	WG	SARC	SAW [	MMC	] →

October	November	December	January	February	March	April	May	June	July	August	September	October
	MMC report				1st FW meeting	2nd FW meeting	[submit to	NMFS]	proposed rule	comment period	final rule	effective

Discussion: As with a May 1 start to the fishing year, beginning the fishing year on October 1 extends the gap between availability of best scientific information and implementation of a framework adjustment. With this schedule, there are 24 months between the last month of the fall survey and the start of the fishing year, when framework measures take effect.

Although it may be somewhat arbitrary, this change to the fishing year may alleviate administrative burdens associated with annual permitting/FMP adjustments because it separates the multispecies fishing year from fishing years for other fisheries. In addition, the gap between the most recent available landings data and framework implementation (22 months) is smaller than that for a fishing year beginning May 1 or January 1. Beginning the fishing year in October may reduce the intense derby fishing that currently occurs in the beginning of the fishing year (May 1), with new DAS allocated during the most productive months of the fishery.

Fishing Year Beginning in July – July 1-June 30

The fishing year will begin on July 1 and end on June 30.

FY JULY 1 - JUNE 30

September	October	November	December	January	February	March	April	May	June	July	August	September
Survey	Survey			Index	Age		WG	WG	SARC	SAW [	MMC	] →

October	November	December	January	February	March	April	May	June	July
	MMC report	1st FW meeting	2nd FW meeting	[submit to	NMFS]	proposed rule	comment period	final rule	effective

Discussion: As with a January 1 start date, beginning the fishing year on July 1 would minimize the gap between availability of the best scientific information and the implementation of the framework while maintaining a realistic schedule for administrative purposes. With this schedule, there are 21 months between the last month of the fall survey and the start of the fishing year, when framework measures take effect. A July 1 fishing year may help to more closely coordinate the management of transboundary stocks with Canada and/or other countries, since the Canadian groundfish fishing year begins close to that date (June 1). Beginning the fishing year in July may also help to reduce high fishing pressure during the spring months when spawning of some species is occurring while providing harvesting opportunities during productive summer months. In addition, it eliminates the administrative burden associated with a January 1st start, when the fishing year for some other regional fisheries begins.

DAS Pro-Ration

DAS are allocated based on the fishing year. A change in the fishing year raises the question of how DAS will be prorated. In addition, DAS may need to be prorated if the Amendment measures are implemented at time other than the start of the fishing year. Two options were considered.

DAS Proration Option 1

New DAS allocations are effective at the start of the next fishing year after implementation of the Amendment. The period between adoption of the management measures and the start of the next fishing year is defined as a transition period. During this period, a vessel will be limited to its 2003 allocation [based on the *CLF et al. v. Evans et al.* (Framework 33 lawsuit) court order but including any carry-over

DAS allowed from 2003 into 2004] times the number of months in the transition period, divided by 12. (The number of months will be rounded up to the next whole value: three months and one day will be treated as four months). A vessel can carry over up to ten DAS into the new, revised fishing year.

Transition period DAS = (Number of months/12) X (2003 DAS allocation +2003/2004 carry-over)

Example: Assume the fishing year is changed to begin July 1. The transition period is two months long (May and June). For a vessel with a 2003 allocation of 70 DAS, with 5 DAS left over to carry into 2004, the DAS allowed during the transition period would be:

(2/12) X (70+5) = 12.5 DAS

Ten of these DAS could be carried over from the transition period into the new fishing year beginning July 1. If the vessel receives a 60 DAS allocation under Amendment 13, the vessel could use a total of 72.5 DAS from May 1, 2004 through June 30, 2005.

Discussion: This formula is easy to understand and to apply, but may disadvantage vessels that use a high percentage of their DAS during a specific time of the year. This option could result in a short-term increase in DAS.

DAS Proration Option 2
New DAS allocations are effective when the Amendment is implemented. The period between implementation and the start of the next fishing year is a transition period. A vessel is limited to its new allocation times the number of months in the transition period, divided by 12. Each vessel's allocation for the period May 1, 2003 to the start of the next fishing year will be capped by the sum of the transition period allocation plus the 2003 allocation (including any carry-over DAS allowed from 2003 to 2004) times the number of months between May 1 and implementation of the Amendment divided by 12. (The number of months will be rounded up to the next whole value: three months and one day will be treated as four months). A vessel can carryover up to ten DAS into the new fishing year.

Transition period DAS= (Number of months/12) X (Amendment 13 allocation +2003/2004 carry-over)

Example: Assume the fishing year is changed to begin July 1. The transition period is two months long (May and June). For a vessel with an Amendment 13 allocation of 60 DAS, with 5 DAS left over to carry into 2004, the DAS allowed during the transition period would be:

(2/12) X (60+5) = 10.8 DAS

Ten of these DAS could be carried over from the transition period into the new fishing year beginning July 1. If the vessel receives a 60 DAS allocation under Amendment 13, the vessel could use a total of 70.8 DAS from May 1, 2004 through June 30, 2005.

Discussion: This option may disadvantage those who use a high percentage of their DAS at a specific time of the year. It addresses the concern that Option 1 could result in a short-term increase in DAS by immediately implementing the Amendment 13 allocations.

4.1.3.2 US/CA Resource Sharing Understanding

The Council considered not adopting this understanding (the No Action alternative). If this understanding was not adopted, management of GB cod, haddock and yellowtail flounder would not be coordinated with Canadian fishermen. As a result, the lack of coordinated management could lead aggravate overfishing on cod and lead to overfishing on haddock and yellowtail flounder.

The Council also considered options for specific elements of this agreement:

Identification of Participants

Option 2: Sign-in program: Vessel must enroll in US/CA area for a minimum of a 10-30 day period, must give 7 day notice to exit program, must have RA certificate/authorization on board while fishing in the area. No limitations on signing in and out of the program over the course of the year.

- On a given trip, vessel can only fish either inside the US/CA area, or outside the US/CA area (no combined trips), or
- On a given trip, vessels can fish both inside and outside the area

This provision was not adopted. Successful implementation of the agreement requires the ability to verify vessel fishing locations, which can only be done through the use of VMS.

Reporting Requirements

Option 1: Based on other reporting options in A13. If a hard TAC option is adopted for the entire fishery, and reporting requirements are changed to monitor the hard TAC, these provisions should be sufficient to monitor US/CA landings as long as trips in this area can be identified.

This option was not adopted. To be successful, the understanding requires timely reporting of catches of GB cod, haddock, and yellowtail flounder. As a result, the Council adopted more stringent reporting requirements for vessel's fishing in the understanding area.

Option 3: Vessels making trips in the area are required to report their catch through the VMS unit on a daily basis during the duration of their trip.

This option was not adopted because at present a system is not in place to handle daily VMS reporting of groundfish.

Harvest Controls

While a hard TAC was adopted for this understanding, the Council did not choose Option 1 for managing the TAC:

Option 1: When 70-90 percent of target species is projected to be caught, restrictive trip limit goes into place:

- Haddock: 1,500 lbs/day/15,000 lbs. trip
- Yellowtail: 1,500 lbs day/15,000 lbs. trip
- Cod: Half of daily cod TAC adopted elsewhere
- Trip limits can be adjusted by NMFS to make sure TAC is harvested at any time (including prior to the fishing year)

- Consequences of reaching 100 percent of TAC:
  - Option 1: Possession of that specific species is prohibited

- Alternative TAC Allocation Scheme:
  - Set TAC for a shorter period than one year (for example, quarterly)

These measures were not adopted. The Council determined it was better to implement measures at the beginning of the fishing year to reduce the likelihood that the GB cod TAC would be caught, closing the area to haddock and yellowtail fishing. In addition, prohibiting possession would likely lead to discards. Allocating the TACs for shorter periods of time was viewed as administratively burdensome.

Target TAC

The Council did not choose to use a target TAC because of concerns that this would not meet Canadian expectations for controlling the catch in the area. This option included the following elements:

- Target TACs adopted for each species (5Zjm cod and haddock; and 5Zhjmn yellowtail flounder)
- Two options for target TAC

  Option 1: As target TAC is approached, measures become more restrictive. For example:
  - DAS differential: for instance, at 90% of TAC DAS count 2:1 for trips into the area
  - Gear change: for instance, at 90% of TAC requirement to use haddock separator trawl or larger mesh
  - Area closures: at 90% of cod or haddock TAC, area to west of CA II closes to gear capable of taking groundfish. At 90% of yellowtail flounder TAC, area, south of CAII closes to gear capable of taking groundfish.
  - Trip limit adjustments: for instance, at 90% of TAC, RA authorized to reduce trip limit to level that is projected to prevent TAC from being exceeded. Or limits on what percentage of landings from a trip can be particular species.
  - Seasons: Area closed for a specific season as TAC is approached, or seasonal fishing implemented at beginning of fishing year to prevent TAC from being reached.

  Option 2: Implement conservative measures up front to preserve the cod TAC in order to allow a directed haddock and yellowtail flounder fishery:
  - In consultation with the Council, the RA may adjust gear requirements, modify access to fishing areas within the agreement management units, and trip limits to meet established TACs.
  - Flat fish net or separator trawl gear
  - Low cod trip limit – 5% of total catch not to exceed 500 per day
  - RA monitors the respective TACs - At 30% and 60% of the total specified TAC for each species harvested from the agreement management units, the RA may adjust the gear requirements, modify access to the agreement management units, trip limits, and number of trips to ensure the established TACs are reached, but not exceeded.

- Consequences of reaching 100 percent of TAC:
  - Option 1: Trip limit reduction.
  - Option 2: As a specified TAC approaches 100%, the RA may take appropriate action to ensure the respective TACs are not exceeded. The options for ensuring a TAC is not exceeded include, but are not limited to, complete area closures to all fishing that may take cod, haddock, or yellowtail within the agreement management units.

- Alternative TAC Allocation Scheme:
  - Set TAC for a shorter period than one year (for example, quarterly)

4.1.3.3 Administration of Certified Bycatch/Exempted Fisheries

In addition to the proposed action, the Council considered not making any changes. This alternative was not selected because that would not increase the flexibility of the Council to address the concerns raised by current requirements. In addition, the Council considered an additional option for of this program.

Review of Exempted Gears and Certified Bycatch/Exempted Fisheries
The Council considered reviewing exempted gears and certified bycatch fisheries on a fixed schedule. This was not adopted because of concerns it would prove administratively burdensome. The Council will review exempted gears and bycatch fisheries on an ad hoc basis.

4.1.3.4 Special Access Programs

The Council did not select one proposed special access program.

Gillnet Gear Closed Area I Special Access Program
The Council considered a SAP for gillnet vessels to fish in CA I to target haddock. This measure was not selected because of a lack of information on the possible bycatch that may occur. It could be adopted in the future if this information becomes available. Provisions of this program are described below:

Area
Participants may fish in the area defined by the following coordinates (loran coordinates shown for information only):

41–24.5N 069-18.5 W	(43800/13700)
41-22.5N 069-14.5W	(43800/13675)
41-0.0N 069-04W	(43680/13700)
41-07.75N 068-59.5W	(43680/13675)

Season
Gillnet: July 1 through March 31

Haddock TAC
Gillnet: TBD

Incidental Catch Limits
Gillnet: 100 mt incidental catch of cod, 400 lbs/trip. Access program closes when cod limit is projected to be caught.

Gear Restrictions
Gillnet: Maximum of 50 gillnets with 6.5 inch mesh. All nets must be brought back to port when vessel returns to port (regardless whether DAS clock is stopped).

Administrative Requirements
Vessels must declared into the access program in advance of sailing. No fishing is allowed outside the area boundaries on a dedicated closed area access trip.

Observer Coverage
Observers are required on all trips.

VMS
All vessels must be equipped with an approved VMS.

US/CA Resource Sharing SAP
The Council considered limiting the number of trips allowed into the area for the US/CA Resource Sharing Understanding SAP. This measure was not selected because catches in the area will be controlled by a hard TAC on GB cod, haddock, and yellowtail flounder. Two options were considered:

Option 1: One to three trips per month for each vessel, with a maximum of 20 trips per year
Option 2: One to three trips per quarter for each vessel

4.1.3.5 Closed Area Administration

Access to Closed Areas
Several alternatives were considered with respect to access to closed areas. None of these changes were adopted, as the Council determined that the current restrictions are sufficient.

Option 1
The Council considered the following uniform policy for determining which gear is allowed in a closed area:

> When a year-round or rolling closure is established, all multispecies exempted gear will be allowed in the area except gear specifically identified as prohibited. Access for closed areas will be described as follows: "Multispecies exempted gear is allowed in the area, with the exception of …"

An advantage of this option is that access to all closed areas will be described in a consistent manner. However, it may complicate enforcement and impose an administrative burden to specifically identify gears that are restricted from multispecies closed areas. Additionally, it may weaken the effectiveness of closed areas because of minimal levels of bycatch incurred by exempted gears. This option was not selected.

Option 2
The Council considered allowing all Northeast multispecies exempted gear into Closed Area I and Closed Area II, provided there is no retention of multispecies and no other gear on board capable of catching the species in the Northeast Multispecies FMP. This change would result in the following additional gears allowed into Closed Areas I and II:

Pelagic gillnets
Pots and traps (only lobster and hagfish pots currently allowed)
Purse seines (including tuna and herring purse seines)
Shrimp trawls (with a properly configured grate)
Surf clam and ocean quahog dredges
Spears
Rakes
Diving gear
Cast Nets
Tongs
Harpoons
Weirs
Dipnets
Stop Nets
Pound Nets

(Midwater trawls are currently allowed into Closed Areas I and II).

This option makes access to Closed Areas I and II consistent with access to the WGOM closed area. It also focuses protection of closed areas on targeted species while reducing impacts on other fisheries. Several disadvantages to this option are that is complicates enforcement in closed areas, may impact benthic habitat in closed areas, and reduces the effect of closed areas on habitat and fishing mortality to some degree. This option was not selected.

Option 3
The Council considered allowing all multispecies exempted gear into the Nantucket Lightship Closed Area (NLCA), provided there is no retention of multispecies and no other gear on board capable of catching the species in the Northeast Multispecies FMP. Party/charter and recreational fishing vessels are allowed to fish in the area under the current regulations. Party/charter boat operators are required to have an operator's permit, as is currently the case.

The following additional gears would be allowed into the NLCA:

Pelagic gillnets
Pots and traps (only lobster and hagfish pots currently allowed)
Purse seines (including tuna and herring purse seines)
Shrimp trawls (with a properly configured grate)
Spears
Rakes
Diving gear
Cast Nets
Tongs
Harpoons
Weirs
Dipnets
Stop Nets
Pound Nets

(Surf clam and ocean quahog dredges are currently allowed into the NLCA).

This option makes access to the NLCA consistent with that of the WGOM closed area. It also focuses protection of closed areas on targeted species while reducing impacts on other fisheries. However, it complicates enforcement in closed areas, may impact benthic habitat in closed areas, and reduces the effect of closed areas on habitat and fishing mortality to some degree. In addition, access to the NLCA and WGOM closed areas would still differ from CA I and CA II. This option was not selected.

Option 4
The Council considered allowing all multispecies exempted gears into the Western Gulf of Maine year round closure, provided there is no retention of multispecies and no other gear on board capable of catching the species in the Northeast Multispecies FMP. The following additional gears are allowed into the Western Gulf of Maine closure:

Pelagic gillnet gear

(Other exempted gears are currently allowed into the Western Gulf of Maine closed area).

This option makes access to the Western Gulf of Maine closure consistent with that of other closed areas, but only if all exempted gear is allowed into all closed areas. It also focuses protection of closed areas on targeted species while reducing impacts on other fisheries. However, it complicates enforcement in closed areas, may impact benthic habitat in closed areas, and reduces the effect of closed areas on habitat and fishing mortality to some degree. In particular, pelagic gillnets are difficult to distinguish from sink gillnets unless hauled, and Coast Guard cutters do not currently have the ability to haul gillnets. This option was not selected.

Option 5
For any year round closure, access for harvest purposes by any commercial fishing vessel is prohibited.

This option prevents any access to closed areas, maximizing their effectiveness and simplifying enforcement. It may result in adverse economic impacts on gear currently allowed into the year round closed areas. This option was not selected.

Review of Year Round Closed Areas

Scheduled Review of Closed Areas (Preferred alternative)
The Council considered reviewing year round closed areas periodically to confirm they are in the correct location to contribute to the goals of the FMP. The review may result in changes to (such as increasing or decreasing the size of the area, or moving the boundaries), or elimination of, a closed area or areas. The review will be conducted during the fifth year after a closed area is implemented. The existing year round closed areas will be reviewed according to the following schedule, and then every five years thereafter.

Gulf of Maine (WGOM and Cashes Ledge): 2005
Georges Bank: (CAI and CAII) : 2006
NLCA: 2007

Seasonal or rolling closures will be reviewed during the periodic adjustment process.

The PDT will provide advice on the closed areas during its annual review and preparation of the SAFE report. The PDT's report will include the following information:

- Whether the closed area continues to meet the objectives for which it was implemented
- Whether the area helps achieve other FMP objectives than those for which it was designed
- Whether the closed area should be eliminated or boundaries altered to better meet FMP objectives.
- Whether access programs can be designed to allow limited fishing in the closed area in order to achieve OY.

This schedule does not preclude changes to closed areas at other times if the Council documents the need for a change.

This measure would have established a formal schedule to review closed areas on a regular basis, insuring that they continue to achieve the goals of the FMP. This review would have served as an indicator of whether a particular closed area is serving the purpose for which it was established and if not, determine the nature of its current utility. It was not adopted because of concerns the required review would prove to be an administrative burden with few benefits.

4.1.3.6 Leasing of DAS

The Council considered not implementing a DAS leasing program. This was not selected. A DAS leasing program is expected to mitigate the adverse economic and social impacts that will result from the restrictions on fishing necessary to rebuild stocks.

While the proposed action includes a DAS leasing program, the Council considered a number of options for elements of the program that were not selected.

Conservation Equivalency Options
Option 1: Leasing Within Categories
This option was not selected because it is both very restrictive and administratively burdensome. In addition, with the exception of the limited access hook gear permit category, groundfish vessels are not limited in the gear they can use. The requirement in this option that DAS transfers be limited across gear types could not be implemented.

DAS leasing could result in a net increase in fishing mortality if DAS are transferred across disparate platforms. This alternative would limit the ability to reach lease agreements to vessels that meet specified vessel size and gear categories.

- Provisions for Size: A lessor may not lease DAS to any vessel with a main engine horsepower rating that is more than 20% that of the lessee and may not lease DAS to any vessel that is more then 10% of the lessee's vessel's LOA, GRT, and NT.

- Provisions for Gear: Subject to the size provision above, lease agreements will be restricted by gear as follows:

  - Vessels with hook-only (Category D permits) may lease DAS only from other hook-only permit holders.

  - Trip gillnet vessels may lease DAS only from other trip gillnet vessels where the designation must be from that of FY2001. Leased DAS must be used with gillnet gear.

  - Day boat gillnet vessels may lease DAS only from other dayboat gillnet vessels where the designation must be from that of FY2001. Leased DAS must be used with gillnet gear.

  - Limited Access permits other than Category D using hook gear may lease DAS only from other vessels using hook gear. Leased DAS must be used with hook gear.

  - Limited Access permits other than Category D using mobile gear may lease DAS only from other mobile gear vessels. Leased DAS must be used with mobile gear

<u>Option 2:</u> Calibrated DAS
This option was not selected. NMFS proposed a DAS leasing program that used a similar approach to "calibrate" DAS that are transferred between vessels of different sizes. The calibration table approach was criticized as too liberal and likely to result in increased effort.

Creating a standardized measure to calibrate effective effort (hereafter referred to as a calibration factor) across gear types and vessel sizes would provide broader opportunities to match buyers and sellers of leased DAS.

Calibration of DAS across vessel platforms needs to take into account the potential difference in capacity output of each vessel to assure that DAS trades are capacity neutral. Such capacity output measures were developed as part of the latent permit buyout and provide a basis for developing a calibration factor for leasing DAS. For the latent permit buyout, capacity estimates for inactive vessels were based on the average capacity output per DAS for active vessels for six different vessel horsepower clusters. These average values may then be used to develop a schedule of calibration factors to determine the number of potential DAS that may be exchanged (note that this approach is identical to what had been developed for Amendment 7 to the Scallop FMP).

<u>Option A</u>: With this option, DAS leases would be subject to the calibration factors in Table 22. Since the calibration factors in Tables A and Table 23 were not developed specifically to accommodate a leasing program they should be regarded as preliminary and may be adjusted upon further review by the PDT. The number of horsepower classes may also need to be adjusted.

These calibration factors provide for both upward and downward adjustments to DAS based on the buying and selling vessel's horsepower class. A selling vessel in any given class would be able to lease DAS to a buying vessel in the same class at a 1:1 rate. A selling vessel in any given class would be able to lease DAS to any vessel in a lower class at a higher rate but would be able to lease DAS to any vessel in a higher class at a lower rate. For example, if a vessel in the 251-324 horsepower class had 10 DAS available to lease, that vessel could lease exactly 10 DAS to another vessel in the same class. If the same vessel were to lease to a vessel in the 176-250 horsepower class then the buying vessel would receive 11.4 DAS. From a DAS accounting perspective, the selling vessel would have its DAS reduced by 10 DAS while the buying vessel would have its DAS allocation increased by 11.4 DAS.

		Selling Vessel Horsepower Class					
		0-175	176-250	251-324	325-400	401-650	651+
Buying Vessel Horsepower Class	0-175	1.00	1.25	1.42	1.72	2.05	2.76
	176-250	0.80	1.00	1.14	1.37	1.63	2.20
	251-324	0.70	0.88	1.00	1.21	1.44	1.93
	325-400	0.58	0.73	0.83	1.00	1.19	1.60
	401-650	0.49	0.61	0.70	0.84	1.00	1.35
	651+	0.36	0.45	0.52	0.62	0.74	1.00

Table 22 – Option A for calibration of DAS between vessels

Option B: Allowing upward adjustments places a significant burden on the precision of the estimated capacity output by horsepower class that is used to calculate the calibration factors. A more precautionary approach would be set all DAS calibration factors for DAS leases from a larger vessel to a smaller vessel equal to one. The calibration factors that would be associated with this option are shown in Table 23. Under this option any vessel within one horsepower class that was leasing DAS from a vessel in a higher class would lease DAS at a 1:1 rate. Vessels leasing DAS from any vessel in a lower horsepower class would lease DAS at less than a 1:1 rate. For example, a vessel in the 176-250 horsepower class would lease DAS at a 1:1 rate from any vessel in the same or higher horsepower class. However, if this vessel were to lease DAS from a vessel in the 0-175 horsepower class then the DAS would be leased at a 0.8:1 rate. For an exchange of 10 DAS in this case the selling vessel's DAS allocation would be reduced by 10 DAS and the buying vessel's allocation would be increased by only 8 DAS.

		Selling Vessel Horsepower Class					
		0-175	176-250	251-324	325-400	401-650	651+
Buying Vessel Horsepower Class	0-175	1.00	1.00	1.00	1.00	1.00	1.00
	176-250	0.80	1.00	1.00	1.00	1.00	1.00
	251-324	0.70	0.88	1.00	1.00	1.00	1.00
	325-400	0.58	0.73	0.83	1.00	1.00	1.00
	401-650	0.49	0.61	0.70	0.84	1.00	1.00
	651+	0.36	0.45	0.52	0.62	0.74	1.00

Table 23 – Option B for calibration of DAS between vessels

Discussion: The PDT approach to effort control under Amendment 13 is predicated on assuring a more direct link between DAS controls and rebuilding targets for a given fishing year. Under Amendment 7 there was never any real link between DAS allocations and limits on DAS that could or should be used consistent with resource conditions. The combination of establishment of category A, B, and C DAS and a substantial reduction in category A DAS at the start of Amendment 13 could leave vessels without enough DAS available to remain in business. This problem will be more acute for individuals that consistently used a high proportion of DAS and that have few alternative fisheries or Federal permits on which to rely. By contrast, some vessels will receive more DAS than they may need or want to use because they may have qualified based on past rather than more recent groundfish activity.

A leasing program would allow vessels to temporarily increase the number of DAS they may fish by leasing these days from another vessel that chooses not to fish. Such a leasing program would allow for greater economic efficiency but would require that any exchanges be conservation neutral. The following describes a DAS leasing alternative with two alternate mechanisms to assure that DAS exchanges would not result in a net increase in fishing mortality (i.e. conservation equivalent).

Other programs to reduce the number of allocated DAS (such as the court order in the case of *Conservation Law Foundation et al. v. Evans,* or any across the board reduction in DAS without addressing unused DAS) may have similar impacts. Some vessels may not have enough DAS to be operated profitably, while others may have more DAS available than they intend to use. Leasing programs can be used to address the economic issues that result. Without a clear link between the number of DAS used and the number that can be supported, however, a DAS leasing program may result in increased effort and may compromise biological objectives. For example, if there are no reductions in allocated DAS, a leasing program clearly can lead to a transfer of DAS from vessels that do not fish to vessels that do.

Sub-Leasing of DAS
The Council considered allowing DAS to be sub-leased, but did not select this option because it would complicate the administration of DAS leasing program and could lead to speculative leasing of DAS.

Options for limitations on DAS leased

Options on expiration of leasing program
The Council considered allowing a DAS leasing program to continue indefinitely unless changed by a future Council action. This option was not selected. The DAS leasing program proposed is controversial and the impacts are not known with certainty. Allowing the program to continue indefinitely would complicate the review of the program. In addition, an indefinite program might lead participants to enter long-term agreements in the belief the Council would not change the program. Third, a leasing program is viewed by some as a short-term measure designed to mitigate the impacts of the amendment, rather than a permanent element of the groundfish plan. Finally, a long-term leasing program may discourage participation in the DAS transfer program, hindering that programs utility in reducing excess capacity in the fishery.

4.1.3.7 Recreational Fishing Permit

None of the three options that follow were selected because of concerns they would be difficult to administer and would not improve reporting of recreational catches.

Option 2 (Preferred alternative)
Any recreational vessel possessing regulated multispecies in the Exclusive Economic Zone (EEZ) is required to have a federal permit.

Option 3
Any recreational vessel fishing for regulated multispecies in the Exclusive Economic Zone (EEZ) is required to have a federal permit.

Option 4
Any recreational vessel fishing for and possessing regulated multispecies in the Exclusive Economic Zone (EEZ) is required to have a federal permit.

4.1.3.8 Running Clock Alternatives

Neither of the following changes to the running clock were selected because of concerns they would be difficult and/or costly to administer.

Option 2 - Industry funded weighmaster

A vessel can exceed a daily trip limit, and be charged the appropriate DAS to account for the overage, under the following conditions:

- The vessel agrees to have all commercial landings (not just groundfish) supervised and verified by an industry-funded weighmaster. A vessel must notify NMFS that it will participate in a weighmaster program.
- NMFS will establish standards for certifying and monitoring weighmaster programs. These standards will include procedures to document the overage so that DAS can be adjusted.

Rationale: Use of a "running clock" is often advocated as a way to reduce discards. Enforcement officials oppose the practice because of concerns over their ability to enforce its use. This measure attempts to balance both concerns. One weakness, however, is that the weighmaster program may be expensive to the industry. As a result, communities with large groups of fishermen, or access to auctions, may be better able to support the program. The measure may be viewed as unfair because outlying communities with few fishermen may not be able to take advantage of the program.

Option 3 - Extended Modified Running Clock

A vessel may land an amount of fish equal to the daily trip limit for the number of DAS on the trip, plus an additional 48 hours. When doing so, the DAS time ending the trip will be postdated for the time necessary to equal the amount of cod landed. A vessel cannot leave port on another trip until the amount of time has elapsed necessary to account for the amount of groundfish landed. The vessel will report via a separate call-in number.

Rationale: This option was intended to reduce regulatory discards caused by trip limits. It provides a limited opportunity to allow landing of fish that exceed a trip limit, but does so by charging the appropriate DAS.

4.1.3.9 Observer Coverage

Option 1 - No Action

Requirements for observer coverage remain as they were during fishing year 2001, prior to the settlement agreement which resulted from *CLF et al. v. Evans et al.* There is no specified level of observer coverage, however, if a vessel is requested to take an observer on board it is required to do so. This option was not selected because the Council believed it beneficial to go on record for a stated level of observer coverage.

Option 2 – Observer Coverage Level Specified in Court Order (Preferred Alternative)

As a result of the court order in the case of *CLF et al. v. Evans et al.*, effective May 1, 2003, NMFS shall provide 10 percent observer coverage for all gear sectors unless it can establish by the most reliable and current scientific information that such an increase is not necessary to achieve an acceptable level of precision and accuracy.

4.1.3.10 Vessel Monitoring System Requirements

The Council considered not allowing vessels to opt out of the VMS reporting requirements, but did not select this option because it would not help reduce the burdens of regulations on small businesses.

4.1.3.11 Day Gillnet Blocks Out

The Council considered two options that would have changed or eliminated the requirement for day gillnet vessels to take blocks of time out of the fishery. These options were not selected. These blocks of time out of the fishery ensure that gillnet gear is removed from the water and limit the ability of vessels to extend soak time to make up for DAS reductions. Many view this requirement as an equity issue, since gillnets continue fishing while the vessels are not using a DAS.

Option 2
The requirement for day gillnet vessels to take 21 days out of the fishery between June and September is eliminated.

Rationale: The requirement to take 21 days out of the fishery may not be effective or necessary to reduce reducing mortality from this sector because of additional gear and DAS restrictions contemplated in the amendment.

Option 3
The requirement for day gillnet vessels to take 120 days out of the non-exempt groundfish gillnet fishery each fishing year is eliminated. (Approval of this alternative would also remove the requirement to take 21 days out of the fishery between June and September).

4.1.3.12 DAS Counting

The Council considered two alternatives for changing the way DAS are counted. Neither was selected. Either approach would have required a review of DAS allocations and use, and would have required a complete recalculation of all proposed alternatives to achieve rebuilding requirements. This was viewed as an unnecessary administrative burden with little benefit for managing the fishery. The options are described in the following sections.

Option 2 – 15 hour minimum
DAS for all vessels will be counted as a minimum of 15 hours, for all trips over three hours in length.

Rationale: This option applies the same DAS counting method that is used for day gillnet vessels to all vessels.

Option 3 – 24 hour DAS
DAS for all vessels will be counted based on a 24 hour day for all trips over three hours in length. Adoption of this alternative means there will not be any partial DAS (e.g., a trip of six hours will count as one DAS, a trip of twenty-six hours will count as two DAS).

Rationale: This option charges DAS in whole day increments. This creates a closer connection between days fished and DAS allocations, consistent with the early intent of DAS included in Amendment 5.

4.1.3.13 Reporting Requirements

Dealer Reporting
Three additional options were considered for dealer reporting requirements. Options 1, 2, and 4 were not selected because they would not result in a reporting system that would meet the needs of the management plan.

OPTION 1: *No action*.
The existing dealer reporting requirements will not be changed.

OPTION 2: *Trip identifier reporting*

- Current system of reporting, with the addition of trip identifier and the disposition of the species purchased via paper reporting within 15 days of purchase.
- Trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.

- This is not a viable option should a hard TAC alternative be implemented.

OPTION 4: *Daily electronic dealer reporting, with exemption for small dealers*

- Daily electronic dealer reporting as specified in Option 3, unless otherwise exempted,. where the dealer records the vessel's trip identification number and disposition of catch (e.g., human consumption, bait, animal food, reduction, etc.) for all vessels. "Small" dealers would be exempt from the daily electronic reporting requirement and would continue to report under the current reporting system paper based system with the addition of the trip identifier and disposition. A small dealer, for this purpose, would be defined as one that purchases 5,000 lb or less of regulated multispecies per year.
- Trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.

Vessel Reporting Options

Six additional options for vessel reporting requirements were considered. Option 1 and 2 were not selected because the existing reporting system is not sufficient to monitor catches in timely manner for parts of the amendment such as the US/CA Resource Sharing Understanding. Option 3 was not adopted because of concerns over cost and operation requirements for existing VMS systems that make them impractical for many vessels. Option 4 was not adopted for similar reasons, though restricting VMS to larger vessels mitigates some of the concerns raised by Option 3. Option 5 severely restricts the ability of fishermen to operate and is not required since an area management alternative was not selected to control the commercial fishery. Option 6 was not selected, though the proposed action is very similar but allows for development of alternative ways that a vessel can report its catch electronically.

OPTION 1: *No Action*

The current reporting requirements as described in 50 CFR 648 Subpart A would not be changed. This is not a viable option if a hard TAC alternative is implemented.

OPTION 2: *Trip identifier reporting*

- No action, with the addition of trip identifier paper reporting within 15 days of end of month of landing for all permitted multispecies vessels.
- The current VTR requirement would be maintained for all vessels with the addition of the trip identifier. The trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.
- This is not a viable option if a hard TAC alternative is implemented.

OPTION 3: *VMS reporting for limited access multispecies DAS vessels*

- VMS requirement for all limited access multispecies DAS vessels. Vessel captains would be required to report enter landings information (pounds by regulated species) for each NMFS statistical area that the vessel was fishing in or transiting (an entry of zero landings when transiting) when upon exiting a statistical area through the VMS.
- All other multispecies vessels (Small vessel permit category and open access vessels) would report the following information through a call-in number: a) password; b) trip identifier; and c) landings information by NMFS statistical area.
- The current VTR requirement would be maintained for all vessels with the addition of the trip identifier. The trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.

OPTION 4: *VMS reporting for limited access vessels greater than 45 ft.*

- VMS requirement for all limited access multispecies DAS vessels greater than 45 ft in overall length. Vessel captains would be required to report landings information for each NMFS statistical area that the vessel was fishing in or transiting (an entry of zero landings when transiting) when exiting a statistical area through the VMS.

- All other multispecies vessels (DAS vessel less than or equal to 45 feet, small vessel permit category and open access vessels) would report the following information through a call-in number: (a) password; (b) trip identifier; and (c) landings information by NMFS statistical area..
- The current VTR requirement would be maintained for all vessels with the addition of the trip identifier. The trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.

OPTION 5: *Declaration into one fishing area*

- Prior to fishing, all permitted multispecies vessels would be required to declare their intent to fish in a specific area (a NMFS statistical area) for a minimum period of 30 days and would be required to have on board a Letter of Authorization issued by the Regional Administrator. These vessels would report the following additional information through a call-in number: a) password; b) trip identifier.
- Vessels may choose to acquire and operate VMS and be exempt from declaring into one fishing area. Vessel captains would be required to report landings information for each NMFS statistical area that the vessel was fishing in or transiting (an entry of zero landings when transiting) upon exiting a statistical area through the VMS.
- The current VTR requirement would be maintained for all vessels with the addition of the trip identifier. The trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.

OPTION 6: *Call-in system modification*

- Modification to the call-in system that would require all multispecies DAS vessels to report the following additional information when calling-out of the DAS program: a) password; b) trip identifier; and c) landings information by NMFS statistical area. All other multispecies vessels (Small vessel permit category and open access vessels) would report this same information through a separate call-in number.
- The current VTR requirement would be maintained for all vessels with the addition of the trip identifier. The trip identifier may be generated by the vessel or the dealer(s) and will be reported by all parties involved in the transaction.

4.1.3.14 Hand Gear Only Permit Alternatives

The Council considered three additional alternatives for the hand-gear only permit category. Alternative 1 was not selected because it did not leave any opportunity for movement into the sector at a small level of effort. Alternatives 2 and 4 – maintaining the category as open-access –were not selected because they do not address the concern that increases in this sector could jeopardize rebuilding programs.

Alternative 1

Under this alternative, qualification criteria for a hand gear only permit will be the same as those established under the *CLF et al. v. Evans et al.* court order. Hand gear only vessels are limited to 200 pounds of cod. For other species, trip limits are the same as those for limited access vessels. There is no limit on other species at this time, but limits could be adopted in the future if necessary.

Hand gear only permits will include the use of hand-hauled tub trawls limited to between 0 and 500 hooks, with the hook limit to be specified based on comments received during public comment period.

Hand gear only permits can be transferred from one vessel to a replacement vessel, subject to the same restrictions as are applied to limited access permits, including vessel upgrading restrictions.

Alternative 2

Under this alternative, all handgear vessels will remain within the open access permit category. Open access vessels are limited to 300 pounds of cod, haddock, and yellowtail flounder, with no more than 200 pounds of cod. For other species, trip limits are the same as those for limited access vessels. Open access handgear will include the use of hand-hauled tub trawls limited to between 0 and 500 hooks, with the hook limit to be specified based on comments received during public comment period.

Alternative 4 – No Action
The requirements for open access hand-gear vessels will remain as in fishing year 2001, prior to the FW 33 court order. The permit category will remain open access. Vessels will be limited 300 pounds of cod, haddock, and yellowtail flounder per day.
Alternative 3 alternative trip limit

4.1.3.15 Sector Allocation

The Council considered not allowing the creation of voluntary self-selecting sectors. This was not selected because it would have eliminated one way to mitigate the negative impacts of this Amendment on small businesses. In addition, the Council considered a number of different ways to implement self-selecting sectors. These are described below.

Options for submitting proposals
Two options were considered for submission of sector proposals.

1. As part of the Council's periodic adjustment process. This option was not selected because it transfers the burden of organizing a sector to the Council.
2. Written by the sector applicants and reviewed by NMFS. This option was not selected because it removed the Council from the approval process for a sector.

Options for Sector Review
Option 1 – Streamlined Approval Process
The sector will submit its operations plan to the RA. NMFS will conduct a preliminary review of the application, and, if it determines the application is complete, will publish a notice in the *Federal Register* asking for comment on the proposed sector with a 30 day comment period. After reviewing all comments received, NMFS will either approve or reject the application and authorize the sector to operate in accordance with its operations plan. NMFS will advise the Council of any changes in resource allocations that result due to approval of the sector.

This option was not selected because it removed the Council from the approval process for a sector.

Movement Between Sectors
Two options were considered for movement between sectors. These were not selected because they constrained the ability of a sector to define the rules that govern its participants.

<u>Option 1</u>: Allow for open movement between sectors on a fishing year basis. In other words, all selections for the upcoming groundfish fishing year must be made prior to the start of the fishing year but the obligation only holds until the end of that fishing year.

Discussion: At the beginning of this management program, many individuals might be uncomfortable making a long-term commitment to a sector for a variety of reasons. By allowing them to make a short-term commitment, the whole network of sectors will be able to self-organize over the initial years of the program. However, this approach might lead to such instability among and within sectors and compromise their long term success.

<u>Option 2</u>: Require a multi-year commitment for participation within a sector. This can range from 2-10 years depending on the structure of the sector.

Discussion: This requirement will give sectors adequate time to organize their members and develop sector parameters. Mandating a longer-term commitment to a sector will urge members to work together to create a cohesive unit and ensure the success of the group.

Allocation of Resources
The Council considered an option that would allocate resources to a sector in terms of effort (DAS). This was not adopted, as it would make it difficult to control the harvest of a sector.

Option 1: Allocation could be based on current DAS allocations. Note that this option presumes that allocated days would be based on effective days only (i.e. that a program that would eliminate or hold latent effort in reserve). In addition, the sector would be assigned a target TAC for groundfish species based on catch history of the sector participants.

GB Cod Gillnet Sector
The Council considered implementing a GB Cod gillnet sector, but chose not do so because of concerns the proposal was not fully developed. A voluntary sector for this group could be approved in the future. Participation in this sector is open to vessels using day or trip gillnets to harvest GB cod. Permit holders must declare their intention to participate in the sector at least three months in advance of the beginning of the fishing year. Once declared into the sector, the vessel must remain in the sector for the entire fishing year and must abide by the regulations applicable to the sector for the entire year. If a permit is transferred during the fishing year, the new owner must also comply with the sector regulations for the remainder of the fishing year.

TAC
A GB cod quota (hard TAC) will be allocated to the sector. The sector's share of the overall GB cod TAC will be determined by calculating the share of the GB cod harvest taken by gillnet gear during fishing years 1996 through 2001 by the sector participants. Only fish caught using gillnets will be considered.

When the TAC is reached, the commercial components of the sector will cease fishing for the remainder of the fishing year.

Management Measures
Management measures will be specified in the sector operations plan.

4.1.3.16 Gulf of Maine Inshore Conservation and Management Stewardship Plan

This alternative is an approach to area management and was designed specifically to address the stocks in the Gulf of Maine, north of 42°20’N latitude. As such, it does not meet the biological objectives for stocks in other areas and would have to be adopted in concert with another alternative. For example, this alternative could be used as an element of area management.

The details of this proposal are described in the following sections. This proposal was not selected because it did not address, in detail, the measures that would be adopted for areas outside the Gulf of Maine. Comments received during the public comment period addressed this shortfall, but given the limited time available to analyze these suggestions, the Council did not choose to go forward with this concept in Amendment 13. It could be pursued in a future action.

4.1.3.16.1 Management Areas

Three distinct regulatory areas are created in the Gulf of Maine (see Figure 14). A vessel may fish in only one zone. They must declare which zone they will fish in prior to beginning fishing , and must stay in that zone for a minimum of one year. As an alternative, vessels could be allowed a one-time switch during the year subject to a conservation penalty (such as a 2:1 DAS charge).

Inshore Areas:

Area 1: 42°20'N, 69°54'W to the latitude of the Massachusetts/New Hampshire border (43°04.5'N)
Area 2: From the north end of Area 1 north along 69°45'W to 43°15'N, 69°45'W. East along 43°15'N to the 25600 loran line, then northeast to the Hague Line.

Offshore Area: Area north of 42°20'N, east and south of the boundaries for Areas 1, 2, and 3.

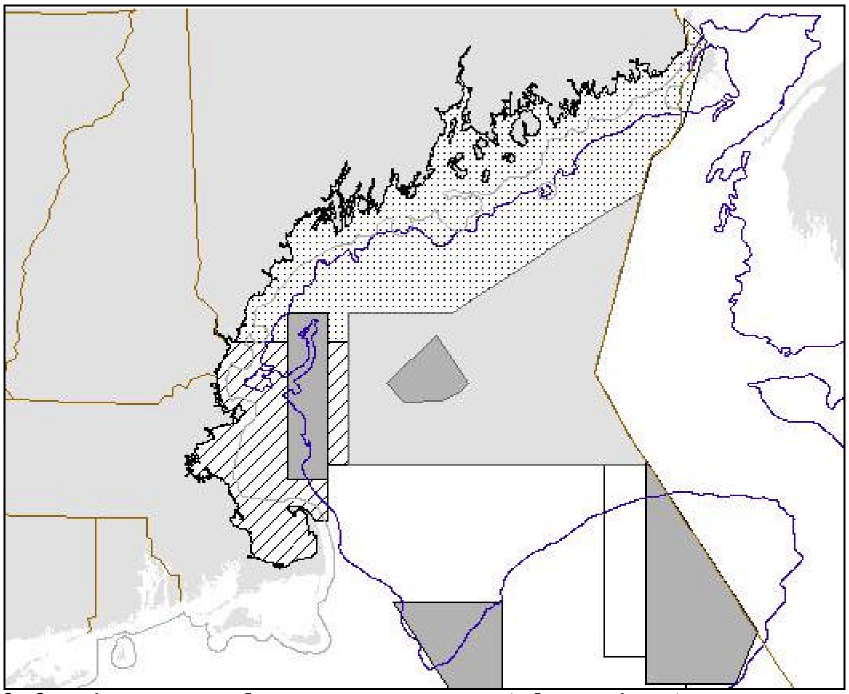


Figure 14 – Gulf of Maine proposed management areas (Alternative 5)

4.1.3.16.2 Fishing Year

The start of the groundfish fishing year is moved to July 1.

Discussion: As described in detail in Appendix XIII, this change moves the start of the fishing year away from when groundfish spawning occurs in the GOM. This may shift some fishing effort off of spawning stocks, as vessel operators will get their new DAS allocations when fish are not aggregated for spawning.

4.1.3.16.3 Possession/Trip Limit

The possession/trip limit for GOM cod is 600 lbs./day with a maximum of 6,000 lbs./trip. Trip limits cannot be changed during a fishing year.

4.1.3.16.4 Effort Controls

Multispecies limited access permits are limited DAS allocations implemented August 1, 2002, with the exception that any permit that qualified for less than 25 DAS will be allocated a minimum of 25 DAS. The difference between the number of DAS that can be used at the implementation of Amendment 13, and the number of DAS allocated in fishing year 2001, is considered "frozen" DAS. Specific criteria will be established that will allow the "thawing" and use of these DAS. Vessels that participated in collaborative research should not lose DAS. Any definition of "latent" DAS will provide protection for vessels engaged in cooperative research.

State management agencies can purchase latent, or unused, permits, and transform them into limited scale Diversification Permits. These permits would be administered or sold by the states to allow commercial fishermen in other fisheries to diversify again and operate at a small scale in the groundfish business. They may also allow for the re-qualification of people who have fished, but not for groundfish, during the last 20 years (since 1983). Diversification Permits would be limited to:

a. One of the three coastal zones
b. Restricted to fish traps, 1,000 hooks, or two jigging machines
c. Allocated with consideration of the long-term (100 years) groundfish yield in each zone.

4.1.3.16.5 Observer Coverage

The desired level of observer coverage is 20 percent of trips on all groundfish boats in all zones.
In addition, all midwater trawl vessels operating in the Gulf of Maine will have 100 percent observer coverage.

4.1.3.16.6 Gear Restrictions

The following management measures apply to the two inshore areas only.

Trawl Gear:

- Maximum of ten-inch roller/rockhopper gear
- Ground cables: maximum of 40 fathoms between doors and wing in the first fishing year after implementation, reduced to 30 fathoms in the second year and 20 fathoms in the third year and each year thereafter.
- Mesh size: 6.5 inch codend. Encourage, where appropriate, composite nets, 6.5 inch square on top, 6.5 inch diamond on bottom
- No night dragging

Gillnets:

- 50 nets maximum for all vessels, for all styles of groundfish gillnets
- Mesh size: 6.5 inch

Hook gear:

- 2,000 hooks per boat for longlining or tub trawling
- 4 jigging machines maximum per boat
- Five hooks per handline or jigging machine, four handlines per boat
- 12/0 circle hooks required for tub trawling or longlining

4.1.3.16.7 Fishing Limitations

Fishing with trawls will not be allowed at night.

4.1.3.16.8 Closed Areas

Seasonal/rolling closures:

March: 121, 122, 123
April: 121-125; 129 - 133
May: 124 - 125; 129-133; 136-140
June: 139-140; 141-147;152
October-November: 124,125; 148, 149, 150, 151, 153, 154, 155

The Herring Committee will consider prohibiting midwater trawl fishing in inshore closed areas I and II and the Western Gulf of Maine closed area

4.1.3.16.9 Changes in Governance Structure

In the future, each zone will have a governance structure that allows the participants declared into that fishery to determine many of the rules for fishing. These Councils will be expected to do the following:

- Change time or gear fished, or locations fished necessary to achieve any area TAC;
- Adjust trip limits to balance requirements for reductions in discards and fishing mortality;
- Change gear technology rules, area, and time fished.

4.1.3.16.10 Recreational Fishing – All Areas

The measures implemented August 1, 2002 will be continued.

Private recreational vessels:

- Minimum cod/haddock size of 23 inches
- 10 cod/haddock per person/per day, except 5 cod limit in GOM December 1 – March 31

Party/Charter Vessels:

- Cod /haddock minimum size of 23 inches for vessels not on a DAS
- 10 cod/haddock creel limit April 1 – November 30
- 5 cod limit GOM December 1 – March 31
- Vessels intending to fish in the GOM closed areas must declare into the charter/party fishery for the duration of the closure or for three months, whichever is greater

4.1.3.16.11 VMS Requirements

There are no VMS requirements for this alternative.

4.1.3.16.12 Possible Modifications

This option relies on a hard TAC in each area to insure biological objectives are met. If stock conditions change, the TAC will result in closure at a different time, but the measures will not be changed until a later Council action. Selection of a different rebuilding program will have the same result.

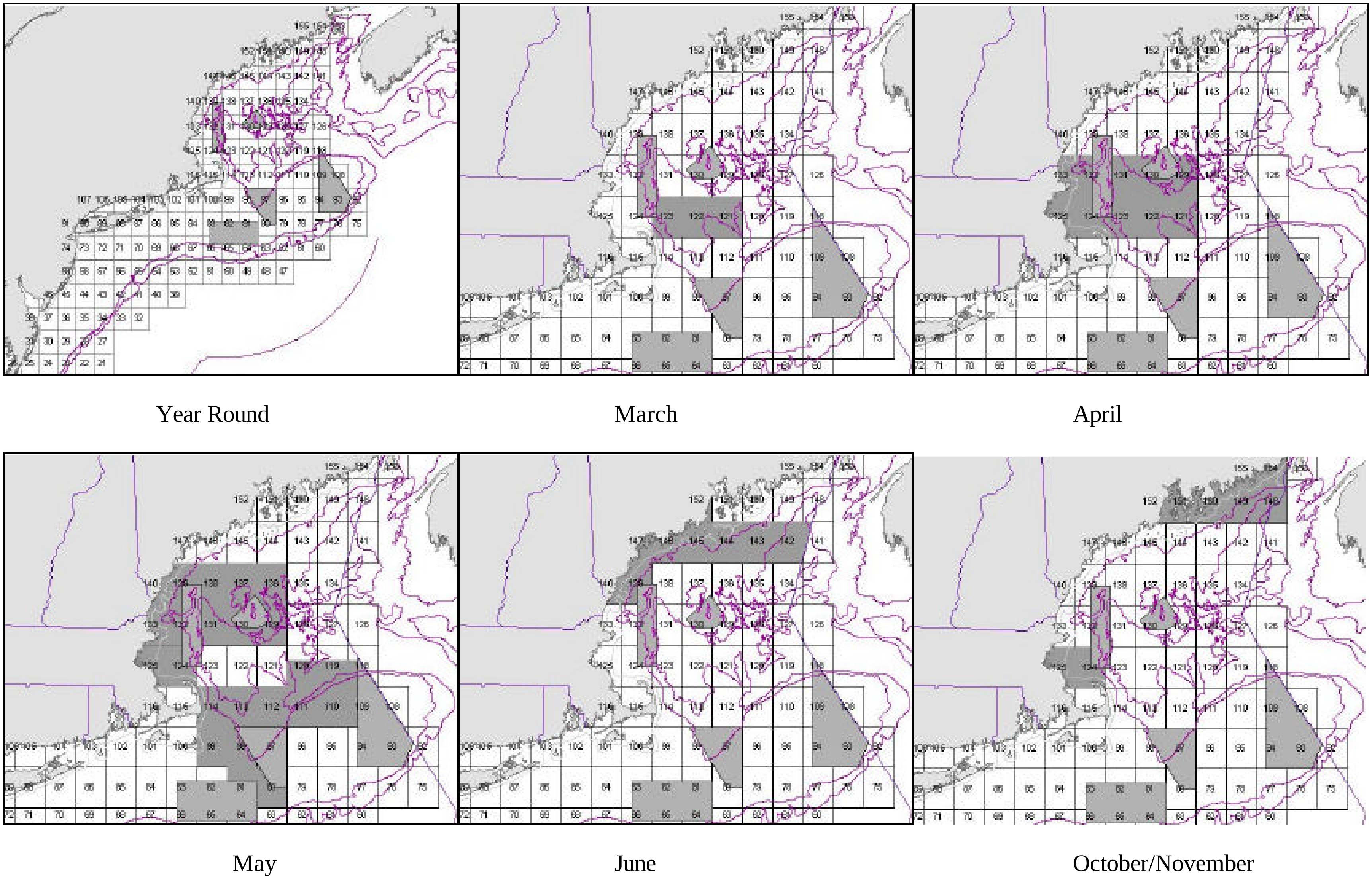


Figure 15 – Gulf of Maine Inshore Conservation and Management Stewardship Plan year round and seasonal closed areas

4.1.4 Measures to Control Capacity

The Council considered several additional alternatives for controlling capacity, described below.

4.1.4.1 No action

Under this alternative, DAS allocations would return to the levels that resulted from the effort reduction schedule of Amendment 7. Absent carry-over DAS or other adjustments (enforcement actions, etc.) vessels will receive the DAS allocations they had during fishing year 2001. No additional measures would be adopted in this amendment to reduce unused DAS, latent effort, or capacity.

This option was not selected because it did not address one of the purposes for the amendment – providing options for reducing harvesting capacity. It does not address the second goal of the amendment – creating a management system so that fleet capacity will be commensurate with resource status.

4.1.4.2 Alternative 1— Permit Absorption

A permit holder can transfer all permits held to another vessel. This alternative would have allowed permit holders to combine scallop and multispecies limited access permits, with some restrictions. It was not selected because it would have required changes to the permitting provisions of other management plans – changes that cannot be implemented solely through a groundfish amendment. The provisions of this alternative are described in the following sections.

Measures

Scallop and multispecies limited access permits may be combined. All permits (for all fisheries) associated with a vessel must be transferred from that vessel to another as a complete package, not distributed separately to a number of vessels. Duplicate permits will expire and the permit history may not be transferred to a third vessel. A multispecies or scallop permit holder may not apply more than one vessel's DAS allocation to a single vessel. The selling vessel is required to retire from fishing and all of its limited access permits must be transferred (sold) to another limited access vessel permit holder. Retirement from fishing means that a vessel may not participate in any other state or federal open or limited access fisheries after its permits are sold. Transfers can only be made between vessels whose characteristics are within the vessel upgrading restrictions.

Restrictions (Conservation Tax)

The recipient of the permits will be subject to some reduction in fishing privileges, imposed by one of the following three options:

Option 1:	No reduction in the number of active or inactive DAS transferred.
Option 2a:	No reduction in the number of active DAS transferred and 20% reduction of inactive DAS.
Option 2b:	10% reduction of the number of active DAS transferred and 20% reduction of inactive DAS.
Option 3:	20% reduction of the number of active DAS transferred and 40% reduction of inactive DAS.
Option 4:	50% reduction of the number of active DAS transferred and 75% reduction of inactive DAS.

For the purpose of this alternative, **active DAS** are determined based on the definition of "effective effort" chosen in Amendment 13. There are nine options for defining effective effort, described in Section 3.5.3.5. If an alternative which defines active DAS is *not* chosen for Amendment 13, active DAS will be defined as the maximum days used (not to exceed current DAS allocations) as determined by the call-in system or days absent computed from the VTR on trips where regulated multispecies were landed, from fishing years 1994 to 1999. **In this document the terms *active DAS* and *effective effort* are used interchangeably.**

Reactivation of DAS – (DAS Use by Permit Buyer)
All DAS acquired by a vessel through a permit transfer and absorption may not be used immediately following the transaction. Instead, they will be made available to the permit recipient according to the following reactivation schedule:

Option 1: 20% of the DAS acquired (after a conservation tax is applied) may be reactivated each year. In other words, a vessel will be allowed to use only 20% of the DAS it bought in the first year, 40% the next year, 60% the next, and so forth.

Option 2: DAS may be used in their entirety at any time following the transaction.

The Council may increase the rate at which the DAS could be activated each year through a framework adjustment.

Discussion
The objectives of this alternative were to provide greater economic opportunity and flexibility in all fisheries, while maintaining the character of the existing fleet and to achieve some long-term reduction in the number of vessels permitted to fish in Northeast fisheries. This long-term reduction will be accomplished through this alternative, since duplicate permits will expire when permits are consolidated.

This alternative relates to fisheries managed by other plans (e.g. Atlantic sea scallop fishery). Measures in other management plans may place limitations on the transfer of permits between groundfish vessels and those in different fisheries. This may reduce participation in the program described in this alternative.

4.1.4.3 Alternative 2—Permit Transfer

This alternative would have allowed limited access permit holders to transfer their multispecies permits to another vessel or vessels, with some restrictions. This alternative was not selected because it would have allowed permit splitting, which is prohibited in other monument plans. As a result, those plans would have required changes. The changes could not be implemented solely through a northeast multispecies plan amendment.

Measures
A vessel may transfer limited access permits that include a multispecies permit, to one or multiple vessels (i.e., the permits may be transferred separately – permit splitting is allowed). The selling vessel is required to retire from fishing and all of its limited access permits must be transferred (sold) to other limited access vessel permit holders or they will expire. Retirement from fishing means that a vessel may not participate in any other state or federal open or limited access fisheries after its permits are sold. Any permits not transferred by the selling vessel will also be retired. Duplicate permits will expire post-transfer. A multispecies permit holder may not apply more than one vessel's DAS allocation to a single vessel. This alternative may be combined with Alternative 4, the freeze alternative. Vessel replacement and upgrading restrictions will apply to these measures.

Restrictions (Conservation Tax)
The recipient of the permits will be subject to some reduction in fishing privileges, imposed by one of the following five options:

Option 1: No reduction in the number of active or inactive DAS transferred.
Option 2a: No reduction in the number of active DAS transferred and 20% reduction of inactive DAS.
Option 2b: 10% reduction of the number of active DAS transferred and 20%

reduction of inactive DAS.

Option 3: 20% reduction of the number of active DAS transferred and 40% reduction of inactive DAS.

Option 4: 50% reduction of the number of active DAS transferred and 75% reduction of inactive DAS.

For the purpose of this alternative, **active DAS** are determined based on the definition of "effective effort" chosen in Amendment 13. There are nine options for defining effective effort, described in Section 3.5.3.5. If an alternative which defines active DAS is *not* chosen for Amendment 13, active DAS will be defined as the maximum days used (not to exceed current DAS allocations) as determined by the call-in system or days absent computed from the VTR on trips where regulated multispecies were landed, from fishing years 1994 to 1999. **In this document the terms *active DAS* and *effective effort* are used interchangeably.**

Reactivation of DAS – (DAS Use by Permit Buyer)
The DAS acquired by a vessel through a permit transfer and consolidation may not be used in their entirety immediately following the transaction. Instead, they will be made available to the permit recipient according to the following reactivation schedule:

Option 1: 20% of the DAS acquired (after the 10 or 20% reduction at time of transfer) may be reactivated each year. In other words, a vessel will be allowed to use only 20% of the DAS it bought in the first year, 40% the next year, 60% the next, and so forth.

Option 2: DAS may be used in their entirety at any time following the transaction.

The Council may change the rate at which the DAS could be activated each year through a framework adjustment.

Discussion
The objectives of this alternative were to provide greater economic opportunity and flexibility in all fisheries, while maintaining the character of the existing fleet and to achieve some long-term reduction in both the number of vessels permitted to fish in Northeast fisheries and the active and inactive DAS in the fishery. This alternative seeks to reduce effort in the fishery without discriminating among vessels based on past performance.

This alternative relates to fisheries managed by other plans (e.g. Atlantic sea scallop fishery). Measures in other management plans may place limitations on the transfer of permits between groundfish vessels and those in different fisheries. This may reduce participation in the program described in this alternative.

DAS Transfer
While the Council adopted the DAS transfer proposal, there were options for its implementation that were not selected.

Restrictions
Option 2 was not selected because the DAS transfer proposal would not have reduced latent effort if this provision was included. In fact, it likely would increase current effort as unused DAS were activated. Option 2 is described below.

Option 2: No reduction in the number of active or inactive DAS transferred.

For the purpose of this alternative, **active DAS** are determined based on the definition of "effective effort" chosen in Amendment 13. There are nine options for defining effective effort, described in Section 3.5.3.5. If an alternative which defines active DAS is *not* chosen for Amendment 13, active DAS will be defined according to one of the following two options:

Option 1: Active DAS are the maximum days used (not to exceed current DAS allocations) as determined by the call-in system or days absent computed from the VTR on trips where regulated multispecies were landed, from fishing years 1994 to 1999.

Option 2: Active DAS are days on which more than 10% of landings by weight (as reported in the VTR) was composed of regulated species from fishing years 1994 to 1999.

Reactivation of DAS
A phase-in of DAS transferred, as described below, was not adopted because it would reduce the incentive for vessels to use the DAS transfer program

Option 1: Phase-In of DAS
20% of the DAS acquired (after a conservation tax is applied) could be reactivated each year. In other words, a vessel would be allowed to use only 20% of the DAS it bought in the first year, 40% the next year, 60% the next, and so forth.

The Council may increase the rate at which the DAS could be activated each year through a framework adjustment.

4.1.4.4 Alternative 4—Freeze on Unused Days-At-Sea

This alternative sought to reduce latent effort in the groundfish fishery by allowing vessels to voluntarily "freeze" their DAS during a specified time period ("freeze period") while incrementally reducing the number of "unfrozen" DAS at an annual rate for the duration of the freeze period.

This alternative was not selected because it is impractical. It would encourage vessels to use all their DAS rather than place DAS in the freeze program. The Groundfish Advisory panel advised that fishermen were unlikely to use this alternative. It would have created an administrative burden with few benefits. The proposed measures are described below.

Measures
Participation is voluntary. Unused DAS of those not participating in the freeze program will be reduced according to one of the following two options:

Option 1: Unused DAS during the freeze period will be reduced 5% annually for permits that do not land groundfish after Amendment 13 is implemented.
Option 2: Unused DAS during the freeze period will be reduced 5% annually for permits that may have landed some groundfish after Amendment 13 but do not use 100% of their DAS.

Once the freeze period expires, permit holders may reenter the fishery with DAS adjusted to reflect the DAS allocated to vessels that remained active in the fishery during the freeze period. The guidelines for use of DAS by those who participate in the freeze program after the freeze period is over will take into account rebuilding that occurred during the freeze and the fleet's remaining active capacity. All vessels, both participants and non-participants in the freeze program, remain subject to additional DAS restrictions implemented in Amendment 13.

There are two options for determining the duration of the freeze:
Option 1: A 5-year freeze
Option 2a: A freeze until 75% B_{MSY} is reached for all stocks combined.
Option 2b: A freeze until 75% B_{MSY} is reached for cod, haddock, and yellowtail stocks combined.

Discussion

The objectives of this alternative are to reduce the level of allocated fishing effort during rebuilding periods without discriminating among vessels based on their past performance.

4.1.4.5 Days-at-Sea Reserve

While the Council adopted the DAS reserve program, there were a number of options considered for defining "effective" effort. This "effective" effort is shown in Table 323, Table 324, and Table 325. These tables include distributive impact data by permit category, length class and homeport state for the options for defining effective effort. In 2002, NMFS completed a latent effort permit buyback program for the multispecies fishery. The vessels that participated in the buyout program were removed from the fishery in Spring 2002. Since these vessels will not participate in the fishery any longer, the fishery impacts from the options for defining effective effort have been calculated without the inclusion of these vessels. In all cases, "landing" refers to the commercial landing of fish for sale, and not to landings by recreational or charter/party fishing vessels.

The higher the number of DAS that are defined as "effective" effort, the greater the percentage of "effective" DAS that will be placed into Category B DAS (that is, they cannot be used at the implementation of Amendment 13) in order to achieve real DAS reductions. The number of DAS that contributed to fishing mortality in fishing year 1999 is 51,500 DAS. Any DAS reductions must reduce the number of DAS used below this level.

***Current allocation* refers to FY 2001 allocation.**

Option 1: Effective effort is defined as the maximum DAS used by a permit in any single fishing year from 1994 to 1999, not limited by current allocation*.
Resulting Effective Effort in DAS: 81,000 of 131,000 (Approximates).

Option 2: Effective effort is defined as the maximum DAS used by a permit from 1994 to 1999 in any single year, not to exceed the current allocation*. For vessels that were not required to use DAS before 1996, only trips that documented one pound of groundfish or more are counted.
Resulting Effective Effort in DAS: 67,000 of 131,000 (Approximates).

Option 3: Effective effort is defined as the maximum DAS used by a permit from 1994 to 1999 in any single year not to exceed the current allocation*. For vessels that were not required to use DAS before 1996, only years in which at least 5,000 pounds of groundfish were landed may be considered when calculating new baseline.
Resulting Effective Effort in DAS: 62,500 of 131,000 (Approximates).

Option 4: Effective effort is defined as the maximum DAS used by a permit from 1994 to 1999 in any single year not to exceed the current allocation*. For vessels that were not required to use DAS before 1996, only trips that documented one pound of groundfish or more are counted. An additional 10 DAS is added to all permit holders not to exceed current allocations*.
Resulting Effective Effort in DAS: 73,500 of 131,000 (Approximates).

Option 5: Effective effort is defined as the maximum DAS used by a permit from 1994 to 1999 in any single year not to exceed the current allocation*. For vessels that were not required to use DAS before 1996, only trips that documented one pound of groundfish or more are counted. An additional 10 DAS is added to all permit holders not limited by current allocations*.
Resulting Effective Effort in DAS: 77,000 of 131,000 (Approximates).

Option 6: Effective effort is defined as the maximum DAS used by a permit in any single year from 1996 to 1999, not to exceed the current allocation*.

Resulting Effective Effort in DAS: 63,500 of 131,000 (Approximates).

Option 7: Effective effort is defined by calculating a DAS utilization percentage (X) for each permit holder based on the fishing year with the highest number of DAS used in fishing years 1996-1999. Only DAS called-in where there is an associated catch (e.g. at least a pound of fish reported would apply) would be considered a "used" DAS. If a permit did not record any commercial fishing revenues since fishing year 1996, no DAS are defined as effective.

Depending on the percentage of DAS used in the best year, a tiered method for defining effective DAS is applied as follows:

0% > X < 25%	=	20% of DAS allocation is effective
25% > X < 50%	=	34% of DAS allocation is effective
50% > X < 75%	=	68% of DAS allocation is effective
75% > X = 100%	=	95% of DAS allocation is effective

Resulting Effective Effort in DAS: 68,000 of 131,000 (Approximates).

Option 8: Effective effort is defined as the allocation of DAS implemented on August 1, 2002 in the interim measures established as a result of the Framework 33 lawsuit (*CLF et al. v. Evans et al.*).

Resulting effective effort in DAS: approximately 58,200 of 131,000. Baseline before 20 percent reduction is about 71,000 DAS.

The Council did not select these other alternatives because it believes that Option 9 (the proposed action) most fairly distributed DAS based on recent groundfish fishing activity.

4.1.4.6 Alternative 6—Mandatory latent effort categorization with voluntary flexibility options

This alternative combines the core elements of Alternative 5 with the tools of permit transfer, permit absorption and days-at-sea transfer in Alternatives 1-3. This alternative illustrated the ability of the Council to adopt more than one of the proposed capacity measures. In essence, the proposed action is a variation of this alternative because the Council adopted both the DAS reserve and the DAS transfer proposals (Option 3 below).

Measures

There is an inherent conflict with the reactivation schedules and transfer taxes in Alternatives 1-3 and the categorization of allocated DAS to A, B, and C days in Alternative 5. To address this problem, the reactivation schedules and transfer taxes are eliminated from this alternative and the vessels will be subject to the reactivation restrictions under Alternative 5. For instance, if a permit is transferred, the buyer will receive a permit with Category A, B and C days as defined under the seller's effort history. If a permit holder wishes to transfer DAS to another permit holder, the buyer will receive DAS in categories A, B, and C as defined for the seller.

Transfers of DAS or permits must occur within upgrade parameters so that that they will remain nearly conservation-neutral. **The Council will place a cap on the number of permits or DAS an individual is allowed to hold.**

Option 1: **Adoption of Alternative 5 first and then Alternative 1**
After DAS are categorized for each permit holder via a selected method for defining effective effort, permit absorption may occur in the fishery within the constraints of the DAS categories.

Option 2: **Adoption of Alternative 5 first and then Alternative 2**
After DAS are categorized for each permit holder via a selected method for defining effective effort, permit transfer may occur in the fishery within the constraints of the DAS categories.

Option 3: **Adoption of Altemative 5 first and then Alternative 3**
After DAS are categorized for each permit holder via a selected method for defining effective effort, days-at-sea transfer may occur in the fishery within the constraints of the DAS categories.

Option 4: **Adoption of Alternative 5 first and then utilize multiple flexibility and consolidation tools**
After DAS are categorized for each permit holder via a selected method for defining effective effort, permit absorption, permit transfer and days-at-sea transfer may occur in the fishery.

Discussion
The objective of this alternative is to develop specific controls on the rate at which latent effort can enter the groundfish fishery through mandatory DAS categorization measures while allowing vessels to remain profitable through flexibility and consolidation options.

4.1.5 Management Alternatives to Address Rebuilding Requirements

The Council considered four broad alternatives to address rebuilding requirements for the commercial fishery, and four options for the recreational fishery. The non-selected alternatives are described below, with brief explanations of the reasons they were not selected.

4.1.5.1 No Action Alternative

Under this alternative, the management measures in place during fishing year 2001 would be maintained. DAS allocations will return to the levels that resulted from the DAS reduction schedule adopted in Amendment 7. These measures have not been achieving the biological objectives of the Amendment. As a result, if the Council selects this alternative, the Secretary of Commerce would most likely prepare an FMP that meets the biological objectives. This alternative was not selected because it did not meet M-S Act requirements to adopt formal rebuilding programs for overfished stocks and to end overfishing. Only brief discussions of the impacts of this alternative are included in this Amendment.

There was considerable public comment that these measures were not the appropriate no action alternative to use as a basis for analysis. These measures were not in place during fishing years 2002 and 2003. Interim measures were implemented consistent with a negotiated settlement agreement in the *CLF et al v. Evans* court case. These interim measures, however, can only be in place for a limited period and are scheduled to expire. It is also unlikely that the no action measures would remain in place absent this amendment, since they do not comply with M-S Act requirements. Either NMFS or the court would implement measures to meet M-S Act requirements. Nevertheless, the Council was directed by NMFS to use the measures in place in fishing year 2001 as the no action alternative because the interim measures have a fixed effective date and it is not certain what measures would replace them if this amendment is not adopted. The Council also chose this as the basis because it would provide a readily understood state that the public could use to understand the impacts of the proposed alternatives.

The following section summarizes the major elements of the no action alternative. It does not identify all management measures. Refer to Amendment 7 and the associated framework adjustments for details of this alternative.

Area closures: Area closures remain the same as in FY 2001. The Western GOM Closed Area will be extended until changed by future Council action. GOM seasonal area closures are shown in Figure 16. The Council will continue the backstop provision that if 50 percent of the GOM cod target TAC (based on the average between the $F_{0.1}$ target TAC and the F_{max} target TAC) is landed by July 31, additional closures result. If the contingency is met and the backstop measures are triggered, Cashes Ledge Closed Area will remain closed for one additional month (November) and Blocks 124 and 125 will close in January (see Figure 16).

Trip Limit: Trip limits remain the same as in Framework 33: 400 lbs./day with a maximum possession limit equal to ten times the daily limit (i.e. 4,000 pounds) for GOM cod. Vessels may land a limited overage of cod as follows:

- Vessels not enrolled in the Gulf of Maine Cod Trip Limit Exemption Program are limited to 400 pounds for each day or part of a day on the trip. On trips under 24 hours a vessel may not land more than 400 pounds of cod, and may not land cod again until 24 hours have elapsed from the start of the trip, although the vessel may call-out of the DAS program before 24 hours have elapsed. On trips longer than 24 hours, a vessel may land 400 pounds of cod for each full day (24 hours) of the trip and 400 pounds for any part of a 24-hour period, provided it does not call out of the DAS program until the remainder of that 24-hour period has elapsed. A vessel on a trip longer than 24 hours and landing up to 400 pounds of cod for any part of a (24-hour) day may not leave port or call out of the DAS program for the remaining part of the 24 hours.
- A vessel may not land more than 4,000 pounds, even if the trip duration exceeds ten days.

Trip limits for GB cod remain the same as implemented through Framework 33: 2,000 pounds per DAS, or part of a DAS, with a maximum possession limit equal to ten times the daily limit (20,000 pounds). There are no trip limits for other key stocks.

Adjustment of the haddock trip limit

The Regional Administrator may adjust the TAC for haddock at any time prior to or during the fishing year to prevent exceeding the target TAC or allow harvesting up to 75% of the target TAC, as described below.

(A) Adjustment to haddock trip limit to prevent exceeding target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that the Regional Administrator determines will prevent exceeding the target TAC. This adjustment may be made if the Regional Administrator projects that the target TAC for haddock will be exceeded, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

(B) Adjustment of the haddock trip limit to allow harvesting up to 75 percent of target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that is determined to be sufficient to allow harvesting of at least 75 percent of the target TAC, but not to exceed the target TAC. This adjustment may be made if the Regional Administrator projects that that less than 75 per cent of the target TAC for haddock will be harvested by the end of the fishing year, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

Effort controls: No revisions to the DAS allocation that resulted from the effort reduction program adopted in Amendment 7.
Gear restrictions: No revisions to gear requirements adopted in Amendment 7 and subsequent frameworks. Vessels in the GOM/GB regulated mesh area must use either 6 inch diamond or 6.5 inch square mesh trawl cod ends, 6 inch or 6.5 inch gillnets. Day gillnet vessels are restricted to 80 stand-up nets or 160 tie-down nets; day gillnet vessels must tag nets. Trip gillnet vessels must bring all nets back at the end of a trip. Trawl vessels are limited to 12-inch roller gear in the inshore GOM.
Recreational restrictions: Recreational vessels are limited to 10 fish per angler, combined cod and haddock. There is no possession limit for other groundfish species. Minimum size for cod is 19 inches.

Minimum Fish Sizes: The minimum sizes for commercially caught groundfish species are:

Cod	19 (48.3 cm)
Haddock	19 (48.3 cm)
Pollock	19 (48.3 cm)
Witch flounder (gray sole)	14 (35.6 cm)
Yellowtail flounder	13 (33.0 cm)
Atlantic halibut	36 (91.4 cm)
American plaice (dab)	14 (35.6 cm)
Winter flounder (blackback)	12 (30.5 cm)
Redfish	9 (22.9 cm)

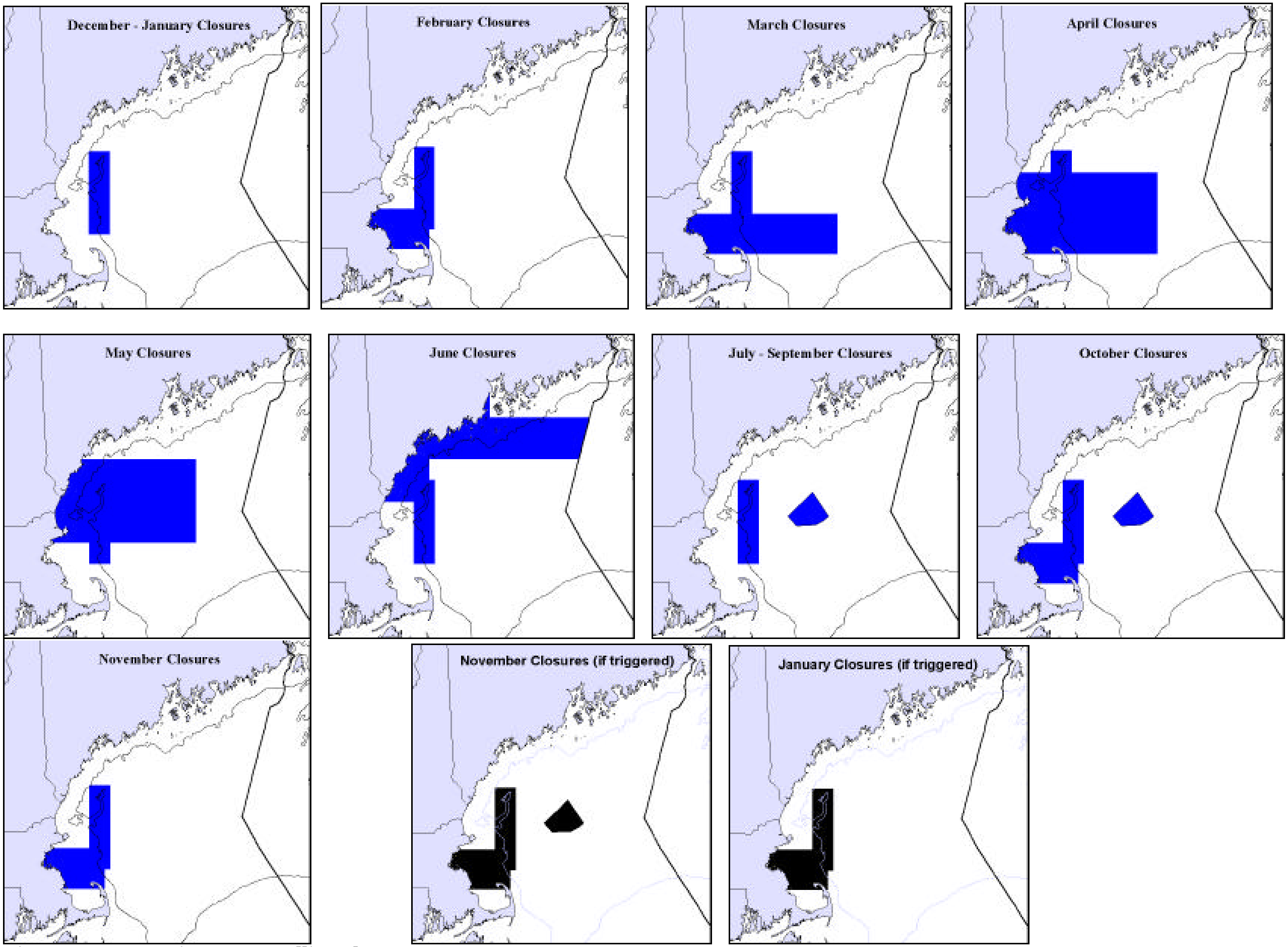


Figure 16 – No action GOM rolling closures

4.1.5.2 Alternative 1 – Up To 65% Reduction in Used DAS

This alternative would adopt all the management measures implemented as a result of a settlement agreement among certain parties in *Conservation Law Foundation et al. v. Evans et al.* Because these management measures are not likely to achieve the biological objectives of Amendment 13, effort controls are imposed to achieve the objectives.

While this specific alternative was not selected, the Council did develop a variant based on comments received during the public comment period. By combining rebuilding trajectories/strategies, the Council was able to mitigate some of the adverse economic impacts caused by the DAS reductions proposed in this alternative.

Effort Controls
The reduction in used DAS depends on the rebuilding strategy selected. Two options are illustrated below.

Option 1: 55 percent reduction in used DAS
This option uses an actual 55% reduction in used DAS as a major element in achieving the mortality reductions in the amendment. It is designed for use with the <u>constant fishing mortality or adaptive rebuilding strategy</u>. The 55% mortality reduction achieves most of the reduction necessary for GOM cod, GB cod, plaice, white hake, and Cape Cod/GOM yellowtail flounder. **An actual 55% reduction in DAS from fishing year 2000 and 2001 levels means that only 28,400 DAS will be fished under this option.** This is 45% of the average DAS used in fishing years 2000 and 2001. *In the analysis of impacts using the Closed Area Model, this is referred to as Alternative 1A when the 2,000 lb-day/20,000 lb–trip GB cod trip limit is used, Alternative 1C when the seasonal hook gear and 1,000 lb-day/10,000 lb-trip GB cod trip limit is used.*

There are a variety of possible ways to achieve the 55 percent DAS reduction in used DAS. As noted earlier, this option assumes that one of the approaches to controlling unused effort suggested by the Capacity Committee or implemented through the FW 33 court order as implemented on August 1, 2002, will be adopted. **The smaller the pool of baseline DAS, the less the additional reduction that must be applied to each permit to reach the targeted 28,400 DAS.**

Section 3.5.3.5 of the capacity reduction alternatives includes alternatives for a variety of ways to calculate "effective" DAS – sometimes referred to as "baseline" or “active” DAS. Table 24 lists some of these alternatives, shows the number of DAS that result, and the additional reduction for each permit in order to achieve the 28,400 DAS target (ignoring any carry-over DAS). The used DAS target may be adjusted as the success of the rebuilding program is evaluated.

Estimation of DAS Allocations to Achieve Target Use for Alternative 1A/1C
The DAS targets in this alternative are based on used DAS, not allocated DAS. Some DAS are not used in every year, suggesting that the allocated DAS can be higher than the targeted used DAS. The difficult question is "how much higher?" Historic use (DAS used/DAS allocated) for each permit category is probably not a good predictor of future DAS use. As allocations become more restrictive, the percentage of DAS used for each permit category is likely to increase from historic levels. Calculating the number of DAS that need to be allocated in order to achieve a target of used DAS is subject to several factors:

> (1) Whether or not leasing or transfers of DAS are authorized by the Amendment. If DAS can be readily transferred, the total number allocated should be equal to the targeted use as it is likely that DAS will be moved from inactive vessels to active vessels.
>
> (2) The option selected for defining "effective effort." If effective effort is defined in such a way that currently active groundfish vessels receive most of the DAS, then the number of DAS allocated should be closer to the targeted number to be used because active groundfish vessels are likely to

continue to use their DAS. On the other hand, if DAS are given to vessels that do not have a recent history of fishing for groundfish, it is not likely that these vessels will start using their DAS under the restrictive measures in Amendment 13. If DAS leasing or other means of transferring these unused DAS are not available, then the number allocated could be higher if it is assumed that these vessels will not use their DAS.

(3) The targeted use level. As the targeted number used declines, a series of interactions could occur that will affect the actual use of allocated DAS. In the absence of DAS leasing or other means to transfer DAS, a low level of used DAS may result in some vessels to choose not to fish at all because they may be unable to remain profitable. A the same time, part-time vessels may recognize an opportunity to fill a market gap and may become more active in the fishery - but only if they have enough DAS to do so, which depends on how effective effort is defined.

(4) Other management restrictions in place. Some measures (for example, area closures or hard TACs) may prevent some vessels from using their allocated DAS.

Estimated reductions in DAS allocations necessary to reach a target DAS level were calculated by applying an assumed use rate by permit category to a given baseline effective DAS definition. Three scenarios were developed for use rates: one assuming DSA leasing or other DAS transfers are authorized and all available DAS will be used, one based on observed 2002 use and another based on a probable increase in use rates. Estimated reductions were also estimated both with and without carry-over DAS. Results are shown in Table 24.

Observed use rates for FY2002 were 90% for individual, 60% for fleet, 69% for combination, 37% for hook-only, and 72% for large mesh permit holders. These use rates seem likely to increase. To account for probable future changes in DAS use the FY2002 the proportion of unused DAS was assumed to decrease by approximately one-half. The resulting use rates that were then applied were as follows: 95% for individual, 80% for fleet, 85% for combination, 70% for hook-only, and 85% for large mesh permit holders.

Based on 2002 use rates, to achieve used DAS of 28,400 days would require a reduction from an effective effort baseline ranging from a low of 32.7% under Option 3 to a high of 48.6% for Option 1 (Table 24). Assuming 2002 use rates continue, the target of 28,400 used DAS could be reached with a 41.4% reduction from the freeze baseline or an additional 21% reduction from FY2002 allocations. Assuming DAS use rates do increase the necessary DAS reduction to keep up with increased effort would have to be greater; about 10 to 13% greater depending on the selected option to define effective. Under Option 8 the DAS reduction would need to be 53.2% from the freeze baseline or an additional reduction of 33% reduction over FY2002 allocations.

Prior to FY2002 only a small proportion of vessels actually used carry-over DAS even though they were available to nearly all vessels. With the proposed DAS reductions under Alternative 1 it seems likely that a much larger number of vessels would take advantage of carry-over DAS from FY2003 which means that the target FY2004 used DAS would probably be exceeded unless carry-over DAS are accounted for. Approximately 11,800 DAS were carried over to FY2002 from FY2001, and to date, 11,400 days were carried over to FY2003 from FY2002. Depending on DAS in FY2003 the number of carry-over days that would be available in FY2004 could be similar to that of FY2002 and FY2003 or may be less if DAS use rates increase.

Assuming carry-over days will be used at the same rate as defined above, the DAS reduction needed to achieve 28,400 used DAS in FY2004 would range from a low of 42.5% to a high of 54.5% under assumed FY2002 use rates and would need to be between 9 and 12% higher if DAS use rates increase (Table 3). Compared to the results reported in Table 1, DAS reduction would need to be increased by between 5 and 10 percent to account for the use of carry-over days. If, as assumed, DAS use rates increase and the number of carry-over days that are used increases, the number of DAS that will be available to carry-over should decline over time. This means that the DAS reduction from an effective effort baseline could be adjusted downward (i.e. a lesser reduction) as available carry-over DAS shrink.

Effective DAS Calculation	DAS Allocated (approximate)	Additional reduction for each permit to achieve 28,400 DAS (assumes all DAS used, no carryover)	Additional reduction for each permit to achieve 28,400 DAS (without leasing/other transfers)			
			Current use, no carryover DAS	Increased use, no carryover DAS	Current use, carryover DAS	Increased use, carryover DAS
None	131,000	78%	63.1%	71.5%	66.3%	74.0%
Capacity Option 1 – Max. DAS used FY 1994 through 1999, not limited by 2001 allocation	81,000	65%	48.6%	58.2%	54.5%	63.3%
Capacity Option 2 - Max. DAS used FY 1994 through 1999, limited by 2001 allocation	67,000	57%	36.7%	49.2%	45.4%	56.6%
Capacity Option 3 – Max DAS used FY 1994 through 1999, with 5,000 pounds rqmnt.	62,500	55%	32.7%	45.7%	42.5%	54.1%
Capacity Option 4 - Max DAS used FY 1994 through 1999, with poundage rqmnt.	73,500	61%	41.5%	53.4%	49.0%	59.7%
Capacity Option 5 - Max DAS used FY 1994 through 1999, with poundage rqmnt., plus 10 DAS	77,000	63%	44.3%	55.6%	51.2%	61.3%
Capacity Option 6 – Max, DAS used 1996 to 1999, limited by 2001 allocation	63,500	55%	33.3%	46.4%	42.9%	54.5%
Capacity Option 7 – Percentage of max DAS used FY 1996 – 1999	68,000	58%	36.8%	49.7%	45.5%	56.9%
Capacity Option 8 - FW 33 Court Order Allocations	71,000	60%	41.4%	53.2%	49.0%	59.5%
Capacity Option 9 – Max DAS used 1996 through 2001, 5,000 pounds reg. Groundfish rqmnt.	68,700	59%	38.8%	50.7%	47.0%	57.7%

Table 24 – Additional DAS reduction necessary to achieve 28,400 DAS under various capacity reduction alternatives. (Note: Option 8 analyzed using baseline (before court ordered 20% reduction) for consistent comparison across alternatives.)

Option 2: Phase-in of 65 percent DAS reduction

This option phases-in over several years a reduction in used DAS that totals 65 percent. It is designed to implement the phased-reduction fishing mortality rebuilding strategy and is not consistent with other rebuilding strategies. Because the fishing mortality in the later years of the program is lower than in the constant mortality strategy, the total reduction in used DAS must also be more in order to achieve the rebuilding obje ctives. *In the analysis of impacts using the Closed Area Model, this is referred to as Alternative 1B when the 2,000 lb -day/20,000 lb – trip GB cod trip limit is used, Alternative 1D when the seasonal hook gear and 1,000 lb-day/10,000 lbd-trip GB cod trip limit is used.*

The used DAS targets for this option are shown in Table 25. These targets may be adjusted by framework action as the success of the rebuilding program is monitored.

Fishing Year	Reduction in Used Das from FY 2000/2001	Used DAS Target
2004	35%	41,050
2005	45%	34,750
2006	55%	28,400
2007	65%	22,100

Table 25 – Planned phase-in of DAS reduction

There are a variety of possible ways to achieve the 55 percent DAS reduction in used DAS. As noted earlier, this option assumes that one of the approaches to controlling unused effort suggested by the Capacity Committee or implemented thr ough the FW 33 court order as implemented on August 1, 2002, will be adopted. **The smaller the pool of baseline DAS, the less the additional reduction that must be applied to each permit to reach the targeted 22,100 DAS.**

Section 3.5.3.5 of the capacity reduction alternatives includes alternatives for a variety of ways to calculate "effective" DAS – sometimes referred to as "baseline" or “active” DAS. Table 26 lists some of these alternatives, shows the number of DAS that result, and the additional reduction for each permit in order to achieve the first year DAS target (ignoring any carry-over DAS). The used DAS target may be adjusted as the success of the rebuilding program is evaluated.

Estimation of DAS Allocations to Achieve Target Use for Alternative 1B/1D

Based on 2002 use rates, to achieve used DAS of 41,050 days for year 1 of the Alternative 1 phased effort reduction would require a reduction as low as 2.7% for effective effort Option 3 or as high as 25.7% for Option 1. Used DAS of 41,050 days could be achieved with a 15.4% reduction from the Option 8 baseline. Note that the estimated reduction for Option 8 is less than the 20% reduction that was actually implemented for FY2002. This is because the observed FY2002 DAS use was less than 41,050 DAS which means that the FY2002 DAS reductions may have been more than necessary to achieve the target DAS use for Alternative 1B. However, this conclusion is contingent on the assumption that DAS use rates will not increase. Should DAS use increase, the needed reduction to keep DAS use to 41,050 days would have to be much greater. For example, the Option 3 reduction would have to be increased to 21.5% while the Option 8 reduction would need to be doubled to 32.4%.

Accounting for carry-over DAS, to achieve a target of 41,050 used DAS for year 1 of Alternative 1B would require a DAS reduction of between 16.8% and 34.2% assuming FY2002 use rates prevail. Should use rates increase, DAS would have to be reduced by an additional 12 to 17 percent depending on the selected effective effort option. These DAS reduction represent an increase of 7 to 14 percent compared to that reported in Table 26.

Effective DAS Calculation	DAS Allocated (approximate)	Additional reduction for each permit to achieve 41,050 DAS (assumes all DAS used, no carry-over)	Additional reduction for each permit to achieve 41,050 DAS (without leasing/other transfers)			
			Current use, no carryover DAS	Increased use, no carryover DAS	Current use, carryover DAS	Increased use, carryover DAS
None	131,000	67%	46.7%	58.8%	51.2%	62.4%
Capacity Option 1 – Max. DAS used FY 1994 through 1999, not limited by 2001 allocation	81,000	49%	25.7%	39.6%	34.2%	47.0%
Capacity Option 2 - Max. DAS used FY 1994 through 1999, limited by 2001 allocation	67,000	39%	8.5%	26.6%	21.1%	37.3%
Capacity Option 3 – Max DAS used FY 1994 through 1999, with 5,000 pounds rqmnt.	62,500	34%	2.7%	21.5%	16.8%	33.6%
Capacity Option 4 - Max DAS used FY 1994 through 1999, with poundage rqmnt.	73,500	44%	15.5%	32.7%	26.4%	41.8%
Capacity Option 5 - Max DAS used FY 1994 through 1999, with poundage rqmnt., plus 10 DAS	77,000	47%	19.5%	35.8%	29.4%	44.1%
Capacity Option 6 – Max, DAS used 1996 to 1999, limited by 2001 allocation	63,500	35%	3.6%	22.5%	17.5%	34.3%
Capacity Option 7 – Percentage of max DAS used FY 1996 – 1999	68,000	40%	8.6%	27.2%	21.2%	37.7%
Capacity Option 8 - FW 33 Court Order Allocations	71,000	42%	15.4%	32.4%	26.3%	41.5%
Capacity Option 9 – Max DAS used 1996 through 2001, 5,000 pounds reg. Groundfish rqmnt.	68,800	40%	11.6%	28.7%	23.4%	38.8%

Table 26 – DAS reduction necessary to achieve 41,050 used DAS under various capacity reduction alternatives. This wouldbe the first year used DAS target under Option 2, phase in of DAS reductions. (Note: Option 8 analyzed using baseline (before court ordered 20% reduction)).

DAS Restrictions
In the SNE and MA regulated mesh areas (see Figure 17), DAS are counted at a differential rate of 1.5:1 during the months of December through April. To facilitate this requirement, a vessel fishing in this area must either:

- Use an approved VMS, or
- Obtain a letter of authorization to fish in the area. A vessel must commit to this program for a minimum of thirty days and cannot fish on a groundfish DAS in any other area during this period.

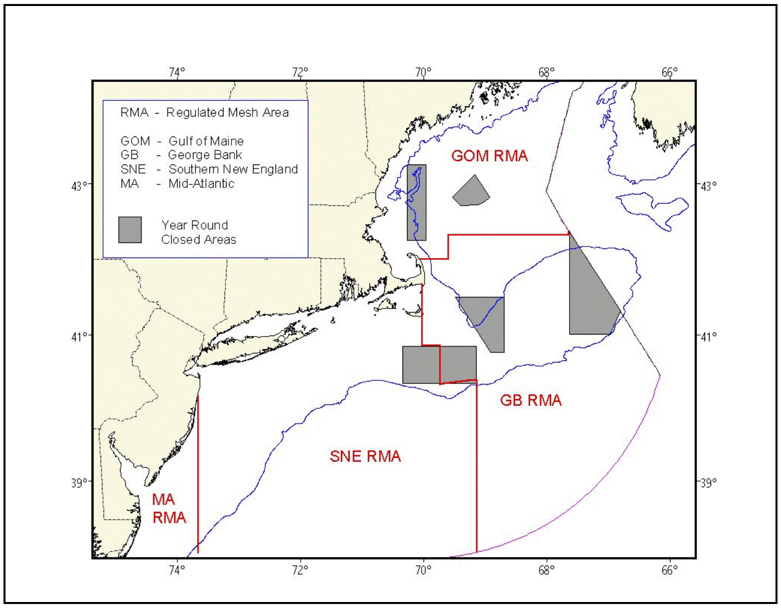


Figure 17 – Regulated mesh areas

Management Measures
All management measures adopted by the negotiated settlement agreement among certain parties as implemented August 1, 2003 are maintained unless changed (see following sections) . These measures are not repeated here, but can be found in 50 CFR 648 Subpart F.

Closed Areas
Year Round Closed Areas
The current Closed Area I, Closed Area II, Western Gulf of Maine, Cashes Ledge, and Nantucket Lightship Closed Areas will be continued as year round closed areas.

Seasonal Closed Areas
The seasonal closed areas are:

March: 121, 122, 123
April: 121-125; 129-133;
May: 124- 125; 129-133; 136-140; 80 – 81; 98-99; 109-114; 118-120 south of 42°20’N
June: 132-133; 139-140; 141-147; 152
October: 124-125
November: 124-125

Possession Limits
GOM cod: 800 lbs/day / 4,000 lbs/trip.
GB cod: Two options:

Option 1A/1B: 2,000 lbs/day /20,000 lbs/trip
Option 1C/1D:
1,000 lbs/day/10,000 lbs/trip for trawl and gillnet vessels
For hook vessels:

- July 1 – September 15: Jig and commercial longline directed cod season. 2,000 lbs./day limit. No groundfish landings on Friday and Saturday.
- September 16 – December 31: Restricted cod season. 600 lbs/day
- January through March: Jig and demersal longline fishing. 2,000 lbs/day
- April, May, June: no jig or demersal longline groundfish fishing on Georges Bank
- In order to use this seasonal hook gear trip limit, vessels must make an annual declaration for using hook gear.

CC/GOM yellowtail flounder: March 1 – May 31: 250 pound possession limit
June 1 – February 28: 750 lbs. per DAS/3,000 lbs. per trip possession limit
SNE/MA yellowtail flounder: March 1 – May 31: 250 pound possession limit;
June 1 – February 28: 750 lbs. per DAS/ 3,000 lbs per trip possession limit

Adjustment of the haddock trip limit
The Regional Administrator may adjust the TAC for haddock at any time prior to or during the fishing year to prevent exceeding the target TAC or allow harvesting up to 75% of the target TAC, as described below.

(A) Adjustment to haddock trip limit to prevent exceeding target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that the Regional Administrator determines will prevent exceeding the target TAC. This adjustment may be made if the Regional Administrator projects that the target TAC for haddock will be exceeded, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

(B) Adjustment of the haddock trip limit to allow harvesting up to 75 percent of target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that is determined to be sufficient to allow harvesting of at least 75 percent of the target TAC, but not to exceed the target TAC. This adjustment may be made if the Regional Administrator projects that that less than 75 per cent of the target TAC for haddock will be harvested by the end of the fishing year, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

Gear Restrictions
The gear restrictions implemented August 1, 2002 are continued with the following modifications (see Table 27 for details)

- Changes to the number of gillnets that can be used by trip gillnet vessels on Georges Bank
- Changes to the number of gillnets in the SNE/MA area
- Changes in restrictions on the use of gillnets in the GOM
- Requirement for a raised footrope trawl in certain areas of the GOM (two options for the area as shown below)

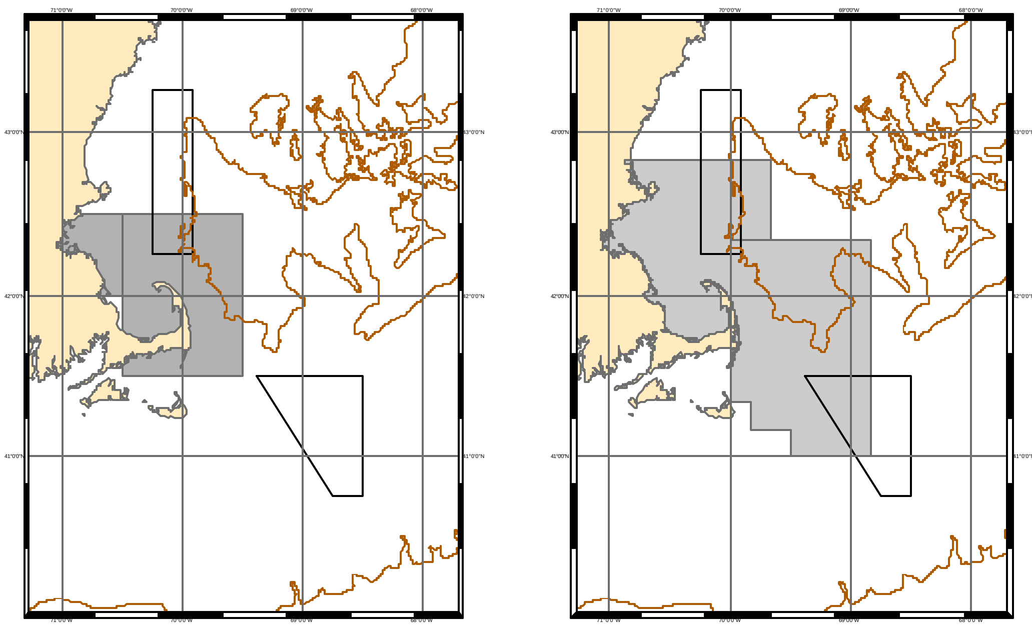


Figure 18 – Two alternatives for the area where use of a raised footrope trawl is required: Option A (left) thirty minute squares 114, 115,123, 124, 124, Option B (right) statistical areas 514 and 521

	GOM	GB	SNE	Mid-Atl
MINIMUM MESH SIZE RESTRICTIONS FOR GILLNET GEAR				
NE Multispecies Day Gillnet Category*	<u>Roundfish nets</u> 6.5" (16.5 cm) mesh; 50-net allowance	<u>All nets</u> 6.5" (16.5 cm) mesh; 50-net allowance	<u>All nets</u> 6.5" (16.5 cm) mesh; 75-net allowance	<u>Roundfish nets</u> 6.5" (16.5 cm) mesh; 75-net allowance
	<u>Flatfish nets</u> 7.0" (17.8 cm) mesh; 75-net allowance			<u>Flatfish nets</u> 6.5" (16.5 cm) mesh; 75-net allowance
NE Multispecies Trip Gillnet Category*	<u>All nets</u> 6.5" (16.5 cm) mesh; 150-net allowance	<u>All nets</u> 6.5" (16.5 cm) mesh; 150-net allowance	<u>All nets</u> 6.5" (16.5 cm) mesh; 75-net allowance	<u>All gillnet gear</u> 6.5" (16.5 cm) mesh; 75-net allowance
Monkfish Vessels**	10" (25.4 cm) mesh/150-net allowance			
MINIMUM MESH SIZE RESTRICTIONS FOR TRAWL GEAR				
Codend only mesh size*	6.5" (16.5 cm) diamond or square Raised footrope trawl required either in Option A: 30-minute squares 114, 115, 123, 124, and 125 Option B: statistical areas 514 and 521 year round		7.0" (17.8 cm) diamond or 6.5" (16.5 cm) square	6.5" (16.5 cm) diamond or square
Large Mesh Category - entire net	8.5" (21.59 cm) diamond or square			7.5" (19.0 cm) diamond or 8.0" (20.3 cm) square
MAXIUM NUMBER OF HOOKS AND SIZE RESTRICTIONS FOR HOOK-GEAR* **				
Limited access multispecies vessels	2,000 hooks	3,600 hooks	2,000 hooks	4,500 hooks (Hook-gear vessels only)
	No less than 6" (15.2 cm) spacing allowed between the fairlead rollers			
	12/0 circle hooks required for longline gear			N/A

* When fishing under a NE multispecies DAS
** Monkfish Category C and D vessels when fishing under a monkfish DAS
*** When fishing under a NE multispecies DAS or when fishing under the Small-vessel permit

Table 27 – Alternative 1 gear requirements

Minimum Fish Sizes

The minimum fish sizes implemented August 1, 2002 are retained (cod minimum size increased to 22 inches) (see below).

Species	Size (Inches)
Cod	22 (55.9 cm)
Haddock	19 (48.3 cm)
Pollock	19 (48.3 cm)
Witch flounder (gray sole)	14 (35.6 cm)
Yellowtail flounder	13 (33.0 cm)
American plaice (dab)	14 (35.6 cm)
Atlantic halibut	36 (91.4 cm)
Winter flounder (blackback)	12 (30.5 cm)
Redfish	9 (22.9 cm)

VMS Requirements

There is no VMS requirement automatically implemented by this alternative. The current call-in system and voluntary VMS will be maintained. Section 3.4.14.2 describes possible changes to vessel reporting requirements that may be adopted by this amendment.

Possible Modifications

The exact management measures chosen will depend on the rebuilding strategy selected and the status of the stocks. The precise choices that may be made are difficult to predict because of the interaction of measures on different stocks in a multispecies fishery. This alternative relies on a reduction in effective DAS, closed areas, gear modifications, and, to a lesser extent, trip/possession limits as the primary tools to reduce fishing mortality. The stocks driving the management program are GOM cod, GB cod, Cape Cod/GOM yellowtail flounder, SNE/MA yellowtail flounder, white hake, and, plaice. To illustrate possible changes that might result if the necessary fishing mortality reduction changes (either as a result of the selection of a different rebuilding program or new assessment information):

Constant Fishing Mortality Rate or Adaptive Rebuilding Strategy:

- An increase in the reduction necessary for GOM cod, GB cod, CC/GOM yellowtail , white hake, or plaice will likely result in fewer used DAS. If the increase is confined to one stock area, (GOM or GB), DAS can be counted at a different rate. Generally, if the reduction in mortality needed increases by 10 percent, the DAS will be reduced by an additional 10 percent.
- Minor changes in the reduction needed for all stocks could result in less of a reduction in DAS use. Generally, for every increase of 10 percent in the necessary reduction, DAS used would increase by approximately 10 percent.
- Major changes in the reduction needed for all stocks (such as GOM cod and GB cod needing less than a 40 percent reduction in mortality and similar changes for other stocks) will result in fewer closures and increases in DAS.

Phased Reduction Rebuilding Strategy:

- If the results of the phase-in of DAS are different than expected, the targeted reduction in used DAS may also change.

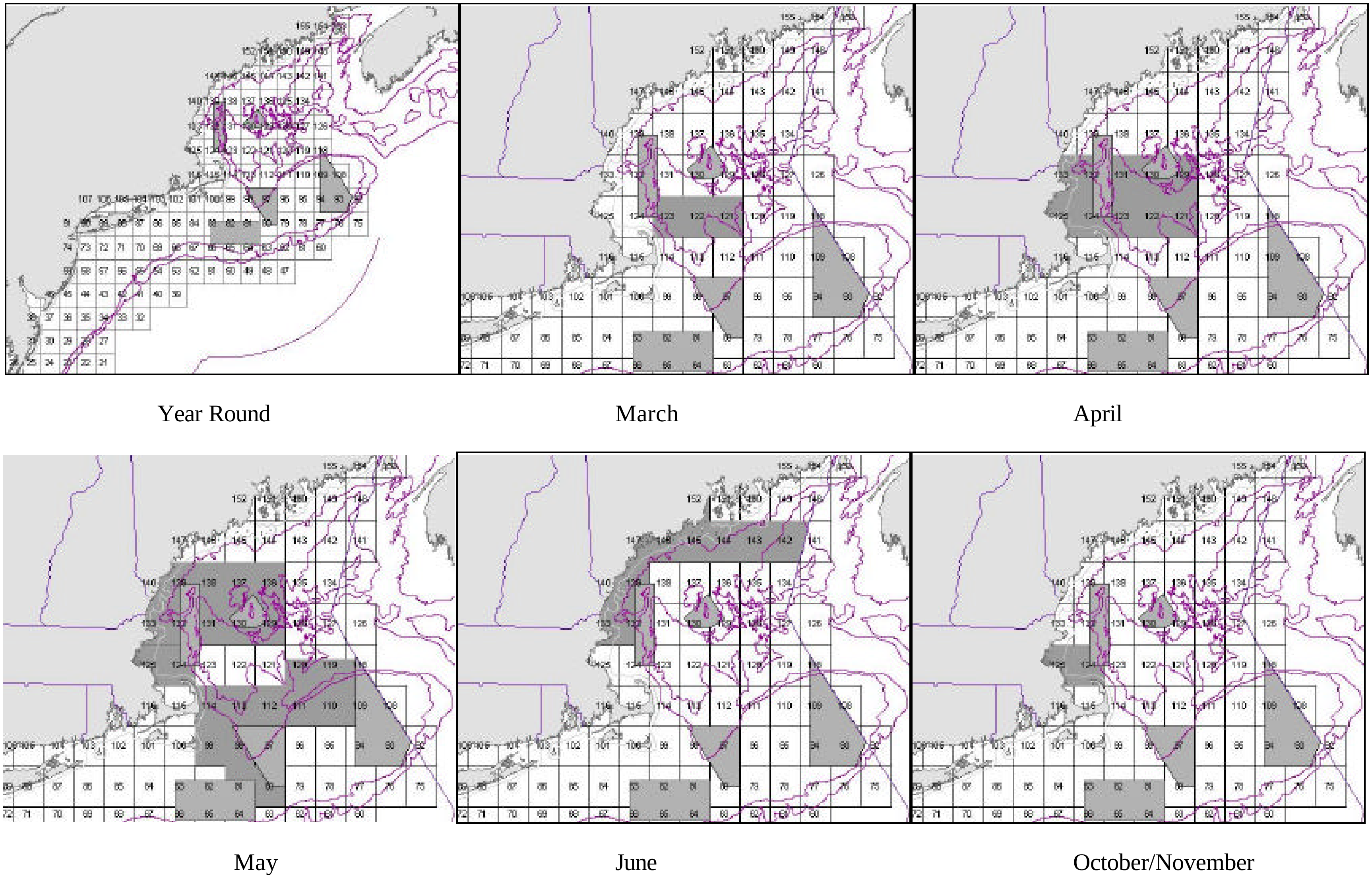


Figure 19 – Alternative 1 year round and seasonal closed areas

4.1.5.3 Alternative 2 – Reduction in Allocated DAS/Gear Modifications

This alternative combined additional gear restrictions and reductions in allocated (not used) DAS. This alternative builds on the management measures implemented as a result of a settlement agreement among certain parties in *Conservation Law Foundation et al. v. Evans et al.* These measures are continued unless changed by the following sections.

This Alternative was not selected. There was uncertainty over the exact impacts of the proposed gear modifications. Analysis suggested that the hard TAC backstop option would be triggered for a number of stocks, leading to excessive discards (if reaching the TAC triggered a prohibition on possession of a species) or a derby fishery and a sacrifice in yield from other stocks (if reaching the TAC triggered a prohibition on all groundfish fishing). The measures that were considered are described below.

Effort Controls

Option 1

Allocated DAS are based on the allocations implemented August 1, 2002 (the baseline established by the court order in the case of *CLF et al v. Evans et al.*, - maximum DAS used over the period 1996 through 2000 - reduced by 20 percent). Vessels wishing to fish in the GOM must sign - in to that area at the beginning of the fishing year. For vessels fishing in the GOM at any during the fishing year, allocated DAS are reduced by 30 percent from the baseline. Vessels fishing in the GOM cannot use more than 25 percent of allocated DAS from May through July. If GOM cod landings are less than 75 percent of the TAC at the end of the third quarter of the fishing year, vessels fishing in the GOM may use up to their full allocation of DAS (August 1, 2002 baseline less 20 percent).

The number of DAS allocated can be changed through future framework actions. At the implementation of the amendment, the DAS allocations are expected to total approximately 58,000 DAS.

Option 2

Allocated DAS are based on the baseline implemented August 1, 2002, reduced by 20 percent. A vessel can only use 70 percent of its baseline DAS in the GOM regulated mesh area. A vessel must declare its intent to fish in the GOM for a minimum of 30 days. All DAS used during that period will be counted against its GOM limit. If GOM cod landings are less than 75 percent of the TAC at the end of the third quarter of the fishing year, vessels fishing in the GOM may use up to their full allocation of DAS (August 1, 2002 baseline less 20 percent) in the GOM. Vessels fishing in the GOM cannot use more than 25 percent of allocated DAS from May through July.

The number of DAS allocated can be changed through future framework actions.

Management Areas

There are no changes to the existing management areas (as revised by the Framework 33 court order).

Closed Areas

Year Round Closed Areas

The current Closed Area I, Closed Area II, Western Gulf of Maine, Cashes Ledge, and Nantucket Lightship Closed Areas will be continued.

Seasonal Closed Areas

In addition to the seasonal closed areas implemented August 1, 2002, the area north of 44N (blocks 148-155) will be closed to vessels fishing for groundfish October and November.

The seasonal closed areas are:

March: 121, 122, 123

April: 121-125;129-133;
May: 124 - 125; 129-133;136-140; 80, 81; 98-99;109-114; 118- 120 (south of 42°20'N)
June: 132-133; 139-140; 141-147; 152
October: 124-125; 148-155
November: 124-125; 148-155

Possession Limits
GOM cod: 500 lbs/day / 4,000 lbs/trip.
GB cod: 500 lbs/day /4,000 lbs/trip. When 75 percent of the GB cod TAC is projected to be taken, the trip limit declines to 100 lbs/day / 1,000 lbs/trip.
CC/GOM yellowtail flounder: 50 lbs/trip in statistical areas 514 and 521 for all gear. No possession of yellowtail flounder when TAC is reached.
SNE/MA yellowtail flounder: March 1 – May 31: 250 pound possession limit;
June 1 – February 28: 750 lbs. day/3,000 lbs. trip possession limit

Adjustment of the haddock trip limit
The Regional Administrator may adjust the TAC for haddock at any time prior to or during the fishing year to prevent exceeding the target TAC or allow harvesting up to 75% of the target TAC, as described below.

(A) Adjustment to haddock trip limit to prevent exceeding target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that the Regional Administrator determines will prevent exceeding the target TAC. This adjustment may be made if the Regional Administrator projects that the target TAC for haddock will be exceeded, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

(B) Adjustment of the haddock trip limit to allow harvesting up to 75 percent of target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that is determined to be sufficient to allow harvesting of at least 75 percent of the target TAC, but not to exceed the target TAC. This adjustment may be made if the Regional Administrator projects that that less than 75 per cent of the target TAC for haddock will be harvested by the end of the fishing year, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

Gear Restrictions
The gear restrictions implemented August 1, 2002 are continued with the following changes. See Table 30. Implementation of gear restrictions that apply to specific areas may be through a sign-in program, similar to the way the GB cod trip limit exemption program is implemented, or as directed by the Regional Administrator.

Georges Bank
Trawl gear: Mandatory use of a haddock separator trawl net and/or a flounder net
Trip gillnet category: 150 nets
Day gillnet category: 50 nets
Hook/longline gear: 1,000 12/0 circle hooks for all multispecies permitted vessels

Gulf of Maine
Trawl Gear: Inshore of 70 W: mandatory use of separator trawl and/or flounder net.
Blocks 114, 115, 123, 124, 125: Raised footrope trawl
Gillnets: Inshore of 70W: 50 nets for both gillnet categories
Blocks 114, 115, 123,, 124, 125: no tie-down gillnets

Hooks/longline gear: 1,000 12/0 circle hooks
Scallop dredge: 10 inch twine top required in blocks 114, 115, 123, 124, 125

A flounder net is defined as a two-seam low-rise groundfish net.
A haddock separator trawl is defined as a groundfish trawl modified to a vertically-oriented trouser trawl configuration, with two codends arranged one above the other. The bottom cod end is left open. A horizontally oriented large mesh (6 ½ inch square mesh minimum) separating panel is installed between the selvedges joining the upper and lower panels, extending from the front of the trouser junction forwards to the aft section of the first belly behind the fishing circle.
Flounder and haddock separator trawl net specifications may be altered by the Regional Administrator.

Minimum Fish Sizes
The minimum fish sizes implemented August 1, 2002 are retained.

Species	Size (Inches)
Cod	22 (55.9 cm)
Haddock	19 (48.3 cm)
Pollock	19 (48.3 cm)
Witch flounder (gray sole)	14 (35.6 cm)
Yellowtail flounder	13 (33.0 cm)
American plaice (dab)	14 (35.6 cm)
Atlantic halibut	36 (91.4 cm)
Winter flounder (blackback)	12 (30.5 cm)
Redfish	9 (22.9 cm

TAC Backstop
There is a risk that reliance on gear modifications and reductions in allocated (rather than used) DAS may not achieve the necessary mortality reductions for all stocks. In order to insure that this option has a high probability of achieving the biological objectives of the amendment, a "hard" TAC, or quota, for each stock will be implemented as a backstop. The TAC or quota will be set to minimize the possibility that it will be exceeded and to allow for incidental catch fisheries to continue as long as possible (see discussion in section 4.1.5.5 for possible ways to administer the backstop TAC). If the DAS reductions and gear are successful, then the hard TAC will not be reached and additional closures will not be triggered.

As per section 4.1.5.5, the Hard TAC/Trip Limit model was applied to this alternative. Specifically, the raised footrope trawl, haddock separator trawl and FY02 used DAS levels were applied to the model. Table 28 and Table 29 show the trip limits that could be implemented at these levels. The trip limit for a particular stock depends on the level of its implementation (that is, at 70% or 90% of the TAC), the selected rebuilding strategy and rebuilding period, whether the TAC is specified on an annual basis or on a trimester basis, and the number of DAS available. The tables provided show the TACs for rebuilding most stocks by 2014 assuming DAS use is similar to FY 2002. These TACs will be recalculated based on the most recent stock status if this alternative is selected, and based on actual DAS allocations. The Regional Administrator may adjust these trip limits as necessary to allow harvesting the TAC.

F_Rebuild

Stock	2004 F_Rebuild TAC	70% Threshold: Threshold	70% Threshold: Weeks to threshold	70% Threshold: Trip limit (per day)	70% Threshold: Week TAC achieved	70% Threshold: Month TAC Achieved	90% Threshold: Threshold	90% Threshold: Weeks to threshold	90% Threshold: Trip limit (per day)	90% Threshold: Week TAC achieved	90% Threshold: Month TAC Achieved
GOM cod	2,663	1,864	10	**145 lbs**	21	Sep	2,397	15	**55 lbs**	20	Sep
GB cod (75% thld)	2,747	1,923	4	**500/100**	7	Jun	4,144	13	**500/100**	22	Oct
white hake	3,199	2,240	22	**565 lbs**	37	Jan	2,879	31	**605 lbs**	37	Jan
SNE winter fl	2,239	1,567	12	**155 lbs**	19	Sep	2,015	17	**55 lbs**	20	Sep
CCGOM yellowtail	235	N/A		**50 lbs**	1	May	see 70% Threshold				
SNE/MA yellowtail fl	645			**250/750**	44	March					
Am. plaice	2,311	1,618	11	**95 lbs**	19	Sep	2,080	15	**35 lbs**	18	Sep

Table 28 – Trip limits implemented at 70% or 90% of an annual TAC, constant mortality rebuilding strategy, with expected week threshold will be met. GOM haddock, GB haddock, Pollock, redfish, GOM winter flounder, GB winter flounder, northern and southern windowpane flounder, GB yellowtail flounder and witch flounder are not predicted to reach the TAC threshold. Landings and threshold in metric tons.

Phased_F

Stock	2004 Phased_F TAC	70% Threshold: Threshold	70% Threshold: Weeks to threshold	70% Threshold: Trip limit (per day)	70% Threshold: Week TAC achieved	70% Threshold: Month TAC Achieved	90% Threshold: Threshold	90% Threshold: Weeks to threshold	90% Threshold: Trip limit (per day)	90% Threshold: Week TAC achieved	90% Threshold: Month TAC Achieved
GOM cod	3,732	2,613	17	**320 lbs**	33	Dec	3,359	25	**290 lbs**	31	Dec
GB cod (75% thld)	5,920	4,144	13	**500/100**	22	Oct	see 70% Threshold				
white hake	3,199	2,240	22	**565 lbs**	37	Jan	2,879	31	**600 lbs**	37	Jan
SNE winter fl	3,011	2,108	18	**275 lbs**	34	Dec	2,710	25	**170 lbs**	33	Dec
CCGOM yellowtail	1,664	N/A		**50 lbs**	22	Oct	see 70% Threshold				
SNE/MA yellowtail fl	1,664			**250/750**	not achieved						
Am. plaice	3,391	2,373	18	**230 lbs**	31	Dec	3,052	25	**190 lbs**	30	Nov

Table 29 - Trip limits implemented at 70% or 90% of an annual TAC, phased reduction rebuilding strategy, with expected week threshold will be met. GOM haddock, GB haddock, Pollock, redfish, GOM winter flounder, GB winter flounder, northern and southern windowpane flounder, GB yellowtail flounder and witch flounder are not predicted to reach the TAC threshold. Landings and threshold in metric tons.

VMS Requirements

VMS is required for all vessels that fish in both the Gulf of Maine and Georges Bank areas over the course of a fishing year.

Possible Modifications
The measures described above are based on a constant fishing mortality rate rebuilding program. The exact management measures chosen will depend on the rebuilding program selected and the status of the stocks. The precise choices that may be made are difficult to predict because of the interaction of measures on different stocks in a multispecies fishery. This alternative relies on a reduction in allocated DAS, closed areas, and gear modifications as the primary tools to reduce fishing mortality. A hard TAC insures biological objectives are met. The stocks driving the management program are GOM cod, GB cod, Cape Cod yellowtail flounder, and, to a lesser extent, white hake, plaice, and Mid-Atlantic yellowtail flounder. To illustrate possible changes that might result if the necessary fishing mortality reduction changes (either as a result of the selection of a different rebuilding program or new assessment information):

Constant Fishing Mortality Rate and Adaptive Rebuilding Strategy:

- Measures will not be modified unless the necessary mortality reduction declines significantly (that is, stocks are in much better shape than assumed during development of the alternative). If that occurs, the number of DAS allocated may be increased. If stock conditions are worse than assumed, the TAC will result in closure earlier in the fishing year, but the measures will not be changed.

Phased Reduction Rebuilding Strategy:

- A schedule for implementation of measures will be developed to achieve declining fishing mortality rates. For example, DAS reductions could be spread over a series of years, or closures could be implemented over successive years rather than implemented the first year.

	GOM	GB	SNE	Mid-Atl
MINIMUM MESH SIZE RESTRICTIONS FOR GILLNET GEAR				
NE Multispecies Day Gillnet Category*	Roundfish nets 6.5" (16.5 cm) mesh; 50-net allowance	All nets 6.5" (16.5 cm) mesh; 50-net allowance	All nets 6.5" (16.5 cm) mesh; 75-net allowance	Roundfish nets 6.5" (16.5 cm) mesh; 75-net allowance
	Flatfish nets 7.0" (17.8 cm) mesh; 75-net allowance Blocks 114, 115, 123, 124, 125: no tiedown gillnets			Flatfish nets 6.5" (16.5 cm) mesh; 75-net allowance
NE Multispecies Trip Gillnet Category*	All nets 6.5" (16.5 cm) mesh; 150-net allowance (50 nets inshore of 70W) Blocks 114, 115, 123, 124, 125: no tiedown gillnets	All nets 6.5" (16.5 cm) mesh; 150-net allowance	All nets 6.5" (16.5 cm) mesh; 75-net allowance	All gillnet gear 6.5" (16.5 cm) mesh; 75-net allowance
Monkfish Vessels**	10" (25.4 cm) mesh/150-net allowance			
MINIMUM MESH SIZE RESTRICTIONS FOR TRAWL GEAR				
Codend only mesh size*	6.5" (16.5 cm) diamond or square Inshore of 70W: separator or flounder net only Blocks 114, 115, 123, 124, 125: raised footrope trawl	6.5" (16.5 cm) diamond or square Haddock separator trawl or flounder net (GB Regulated Mesh Area)	7.0" (17.8 cm) diamond or 6.5" (16.5 cm) square	6.5" (16.5 cm) diamond or square
Large Mesh Category - entire net	8.5" (21.59 cm) diamond or square			7.5" (19.0 cm) diamond or 8.0" (20.3 cm) square
MAXIUM NUMBER OF HOOKS AND SIZE RESTRICTIONS FOR HOOK-GEAR* **				
Limited access multispecies vessels	1,000 hooks 12/0 circle	1,000 hooks 12/0 circle	2,000 hooks	4,500 hooks (Hook-gear vessels only)
	No less than 6" (15.2 cm) spacing allowed between the fairlead rollers			
	12/0 circle hooks required for longline gear			N/A

* When fishing under a NE multispecies DAS
** Monkfish Category C and D vessels when fishing under a monkfish DAS
*** When fishing under a NE multispecies DAS or when fishing under the Small-vessel permit

Table 30 – Alternative 2 gear requirements

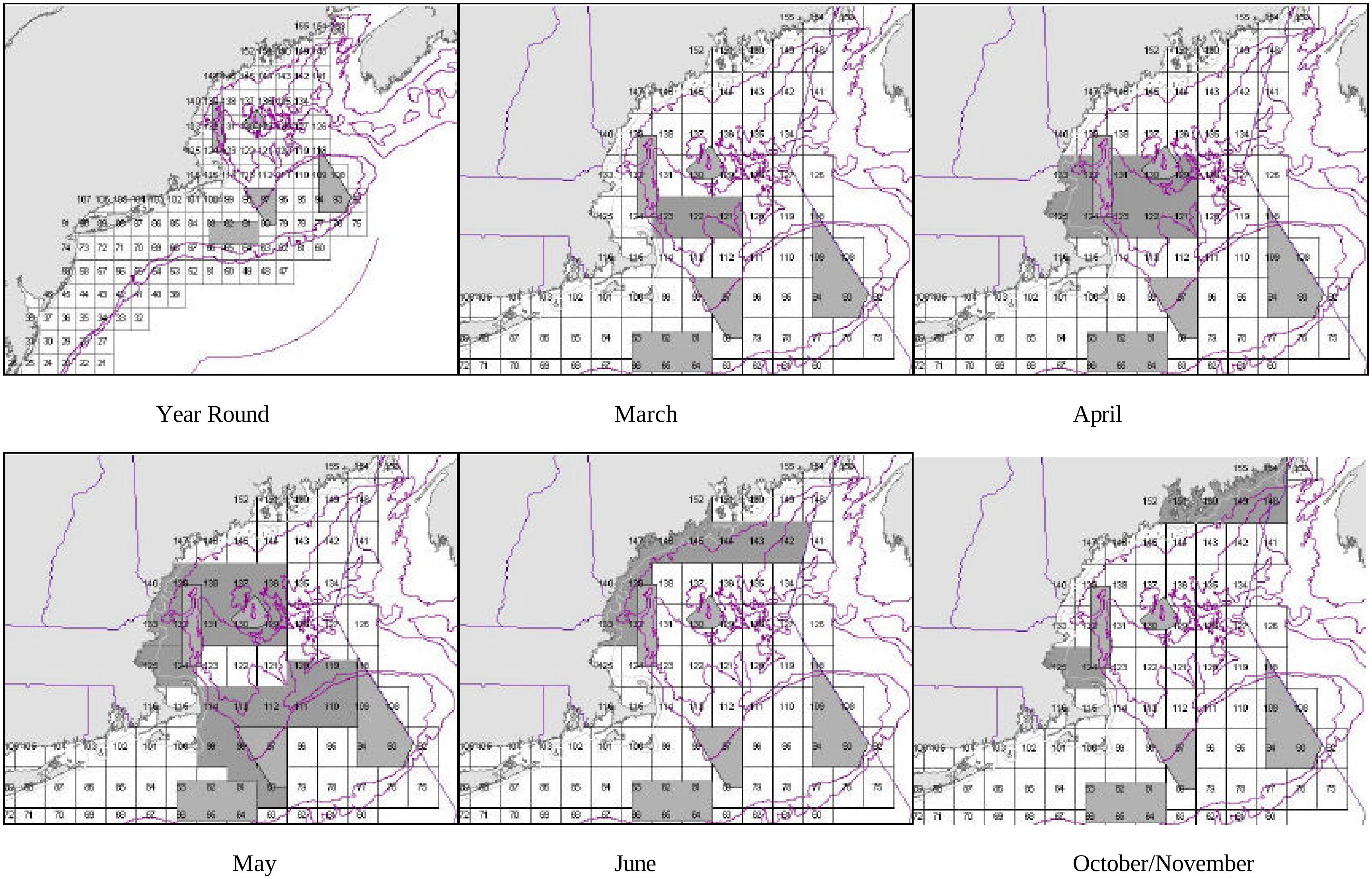


Figure 20 – Alternative 2 year round and seasonal closed areas

4.1.5.4 Alternative 3 - Area Management

The area management alternative is designed for the following reasons:

- Provide for development of management measures that are more consistent with fishing activity and resource conditions in a particular area;
- Encourage a greater sense of stewardship by facilitating the development of management measures by those fishermen that use an area;
- Simplify participation by interested parties in the management process;
- Insure fishing activity in one area does not adversely affect fishing activity in another area

This alternative was not selected because of concerns the complexity of area and species specific TACs would be difficult to implement and administer. In addition, there was concern in the industry that this approach to management would eventually lead to restricting vessels to a particular area, limiting the ability of fishermen to adjust fishing practices based on market or resource conditions.

Definition of Areas

Six options for management areas are proposed as shown in Figure 21 through Figure 26. In general, all of the options have five major areas, with some of the options including a division of the inshore GOM area.

- Area A: Inshore Gulf of Maine, separated into eastern and western sub-areas, defined as A1 and A2, respectively
- Area B: Offshore Gulf of Maine
- Area C: Western Georges Bank
- Area D: Eastern Georges Bank
- Area E: Southern New England/Mid-Atlantic

The following charts illustrate six options for area boundaries. An additional option for areas in the Gulf of Maine is included in the following alternative. All options include a line that identifies statistical areas 5zjm, the area defined for the U.S/Canada resource sharing understanding**.**

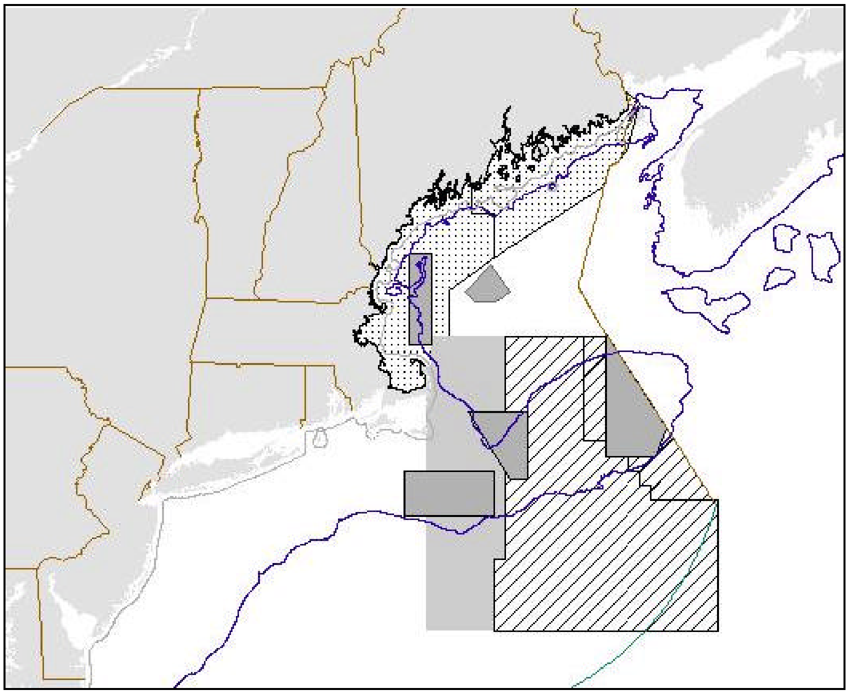


Figure 21 – Option 1 for proposed area management areas

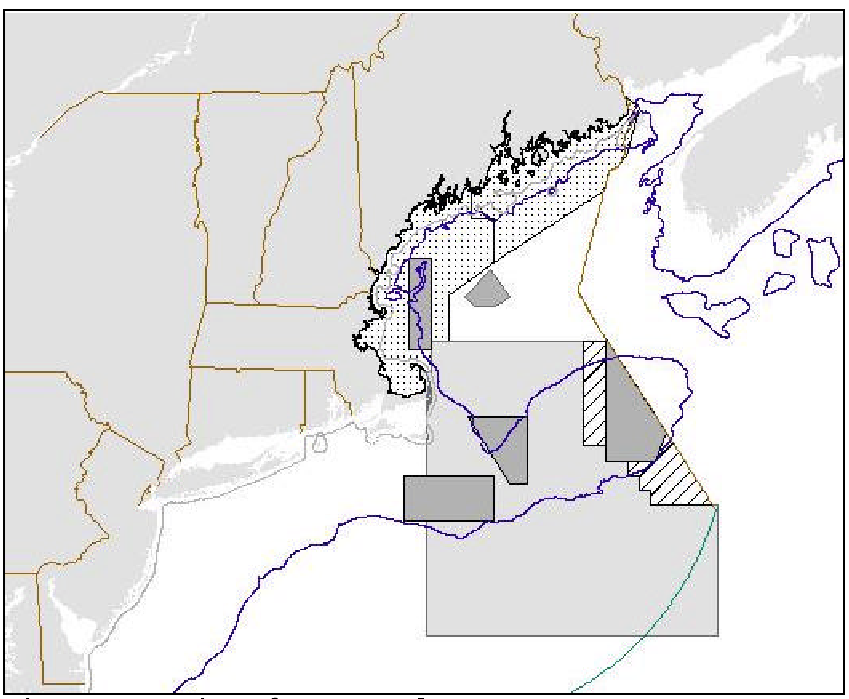


Figure 22– Option 2 for proposed area management areas

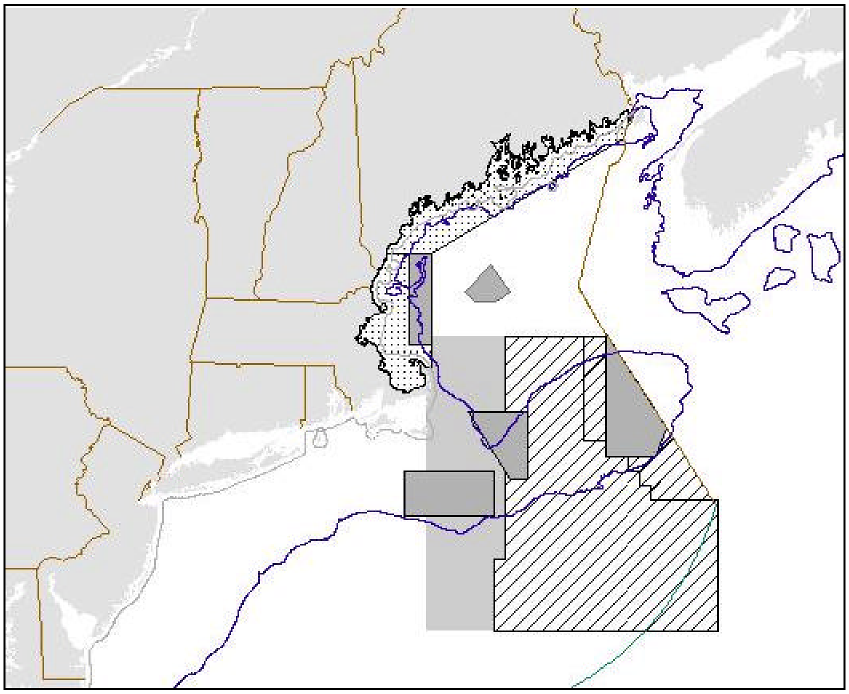


Figure 23– Option 3 for proposed area management areas

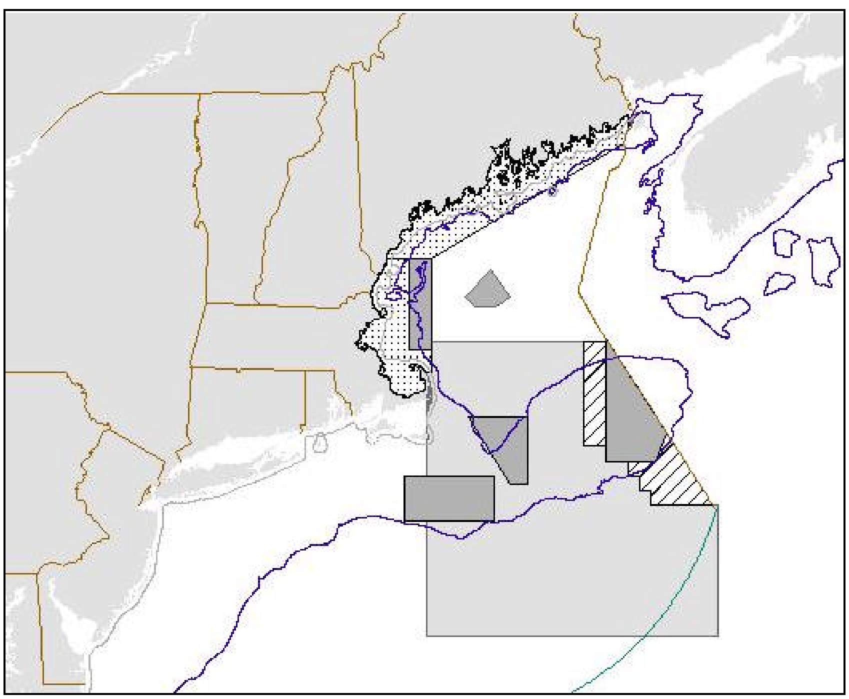


Figure 24– Option 4 for proposed area management areas.

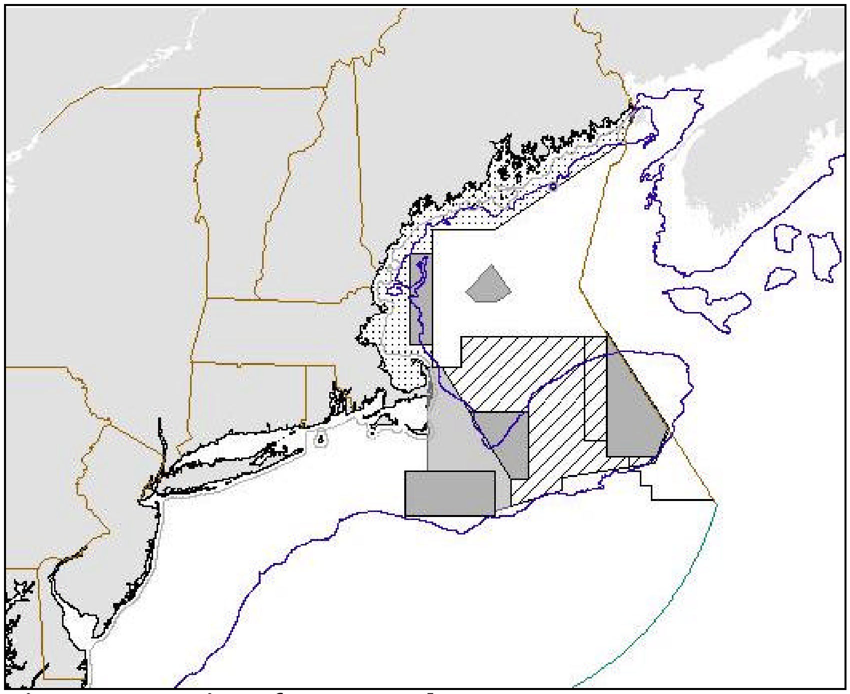


Figure 25 – Option 5 for proposed area management areas

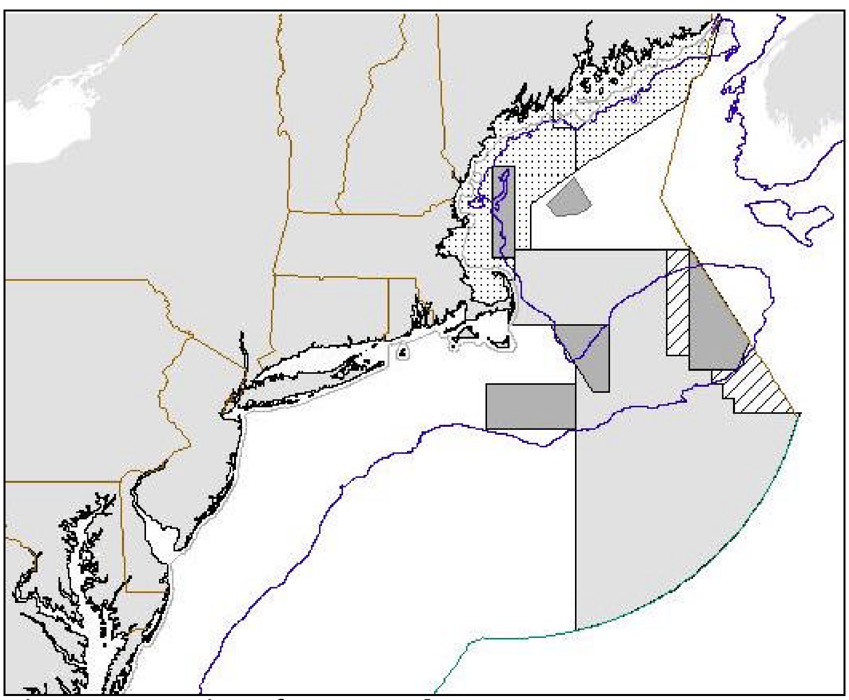


Figure 26 – Option 6 for proposed management areas

Biological Objectives
Species-specific TACs would be defined for each management area. Options for administering the TACs are described in section 4.1.5.5.

Calculation of TACs
In the draft amendment, TACs for each area were illustrated in tables for each area management alternative. These TACs were considered illustrations only and were not the TACs that will be adopted if this alternative is selected. These tables have been deleted since they are no longer pertinent. They are calculated for the major groundfish species only (excluding ocean pout and windowpane flounder). If this alternative is adopted, TACs will be calculated for all regulated groundfish species. If an area management approach is adopted, the TAC will be calculated using the most recent three years of survey data.

Option 1: Species specific TACs for each area will be calculated based on the distribution of each stock. This distribution will be estimated based on survey (spring and fall trawl survey) and vessel trip report information. There are two options for combining survey information with the VTR information. In both instances, the spring and fall surveys are averaged to develop an overall survey distribution.

Option A: Weight the surveys and VTRs equally (50/50)
Option B: Weight the surveys one-fourth as much as the VTRs (20/80)
Option C: Base the TAC on the previous three years survey only (do not include VTR information)

Each of these three options have different strengths and weaknesses. While survey information might be considered more precise and unbiased, the surveys represent stock distribution only during the specific dates of the surveys. The distribution of fish at these two points in time may not accurately reflect the distribution of fish over the course of the year. Incorporating VTR information into the calculation uses information from fishermen to characterize the distribution of fish throughout the fishing year as opposed to just the spring and fall survey periods. The two options for weighting of the survey and VTRs show how sensitive the results are.

There are two options for the period used to determine distribution from the VTRs. This period does not change unless adjusted through a future management action.

Option D: Fishing years 1996 through 1998. This three-year period incorporates when all limited access permits were required to use DAS, but avoids the period when rolling closures may have affected distribution of fishing effort.

Option E: Fishing years 1996 through 2000. This five-year period uses VTRs since adoption of the DAS program for all vessels.

The period used for survey distributions will be the most current three-year period in order to smooth out variations in the annual survey. The dates of the survey will change each year so that the most recent survey information is used.

The distribution for each area will be applied to the stock specific TACs calculated based on the target (not threshold) or rebuilding fishing mortality. TACs will be based on target fishing mortality for two reasons:

- So that management measures are designed to achieve OY

- To reduce the risk of overfishing by providing a buffer between the amount of catch that results in closure of the fishery and the amount of catch that results in overfishing

Option 2: If the resource sharing allocation agreement with Canada is implemented, the same process as is used in Option 1 will be used for all stocks with the exception of Georges Bank cod, haddock, and yellowtail flounder. The U.S. catches of these stocks in statistical areas 5Zjm will not be any higher than that determined by the agreement.

If area options based on the U.S./Canada resource sharing agreement are adopted (Appendix III), the distribution of GB cod, haddock, and yellowtail flounder to the area covered by the agreement will be as determined by the agreement. The allocation of these stocks to Area C will be the remainder of the total TAC. The total amount of cod, haddock, and yellowtail flounder in these two areas will include the appropriate share of the other stocks of cod, haddock, or yellowtail flounder as determined by the stock boundaries.

Discussion: This approach makes the assignment of area specific TACs consistent with any arrangements with Canada.

Consequences for Exceeding TACs

Option 1: If the TAC in an area is exceeded by more than 10 percent, the TAC for the following year will be reduced by the same amount.

Option 2: If the TAC in an area is exceeded by any amount, the TAC for the following year will be reduced by the same amount.

Option 3: TACs in an area are considered target TACs ("soft" TACs). When 80% of the TAC of any species in an area is reached, additional management measures will be put in place to reduce the catch of that species. As much as possible, those measures will be designed to reduce the catch of specific species, but if necessary broad based measures may be applied. Until area-specific "backstop" measures are developed, the Regional Administrator will use differential DAS counting (counting DAS at other than a 1:1 rate) in order to make certain that a the target TAC for a specific species is not exceeded.

Movement Between Areas

There are five options for vessel movement between areas.

Option 1: A vessel may fish in any area at any time. The DAS call-in system and modifications to Vessel Trip Reports (VTRs) will be used to monitor the area specific management measures for those vessels that do not voluntarily participate in the Vessel Monitoring System (VMS). When fishing in more than one area on a trip, the vessel must follow the most restrictive management measures (with the exception of any prohibition on night fishing which would be area specific) regardless of the area currently being fished on a trip.

Option 2: A vessel may fish in any area on a trip, and must follow the management measures for the area currently being fished, with the exception that when fishing in more than one area on a trip, the most restrictive trips limit will apply throughout the trip. The DAS call-in system and modifications to VTRs will be used to monitor the area-specific management measures.

Option 3: A vessel may fish in any area on a trip, but must follow the management measures for the area currently being fished, with the exception that when fishing in more than one area on a trip, the most restrictive trip limit will apply in all areas. If fishing in more than one area during the course of a fishing year, a vessel must be equipped with a VMS.

Option 4: A vessel may fish in only one area on a given trip, and must comply with the management measures that are in effect in that area. When calling in to start a DAS, a vessel must declare what management area it will fish. A vessel fishing in more than one area over the course of a given year must be equipped with an approved Vessel Monitoring System (VMS).

If a vessel wishes to fish in more than one management area over the course of a year, it must declare what percentage of its DAS will be spent in each management area. All time in an area must be considered, not just time fishing. At the end of the fishing year, a vessel must be within +/- ten percent of its time declared in any given area. As an example, if a vessel that uses all its DAS declares that it will spend 50 percent of its time in Area A and 50 percent of its time in Area B, the number of DAS spent in the areas must be within 40 to 60 percent of its DAS allocation and it cannot spend more than 10 percent of its DAS in a third area. If a vessel does not use all its DAS, the number of DAS used in an area cannot exceed by more than 10 percent the number of DAS it declared would be used in an area. If a vessel cannot fish in an area because a TAC was reached, it cannot shift effort into another area.

Option 5: A vessel may fish in only one management area over the course of a fishing year. The vessel must declare to NMFS its choice of management area at least one month prior to its first fishing trip for the year. This declaration of a management area applies to a permit throughout the fishing year, even if the permit's ownership changes mid-year. A vessel/permit is not bound to the area it fished in any previous year, but can only fish in one area in any given year.

Reporting Requirements
In order to monitor the TACs for each management area, timely information is needed on the location of catches by management area. In order to assess stocks, information is needed on catch by statistical area. In most cases, the proposed management areas are not identical to statistical areas, complicating the monitoring of catch, particularly if vessels are allowed to move between areas. Vessel reporting options are described in section 3.4.14.2. If area management is adopted, vessels will be required to report both statistical area and management area for their catch (similar to the current practice in the herring fishery, where vessels must report their catch by management area).

Area-Specific Management Measures
Other than provisions for implementing the area and species-specific TACs, no new management measures are proposed for each area. The measures in effect as a result of the *CLF et al. v. Evans et al.* (Framework 33 lawsuit) court order will be extended until changed in the future through the following process.

Area Management Meetings
The Council's Groundfish Oversight Committee will hold a series of meetings for each management area at the beginning of a fishing year to solicit advice based on the opinions of those who fish in that area and other interested parties. These comments will be forwarded to the Groundfish Advisory Panel for an initial review. Based on these meetings and the advice of the Advisory Panel, the Committee will develop management recommendations for the full Council. In most cases, these measures will be further developed and implemented by the Council through the periodic adjustment process. Upon implementation of the Amendment, however, the Council may choose to follow a different schedule in order to incorporate industry suggestions at an earlier date.

Management Measures Subject to Adjustment
All measures can be revised based on the input of fishermen from each area. It must be recognized, however, that some measures cut across area boundaries. For example, the Council may choose to have requirements for minimum fish sizes, year round closed areas (for both mortality reduction and to reduce

impacts on habitat), and DAS allocations that are consistent in all areas in spite of the recommendations of those fishing in a particular area.

Revisions to Advisory Panel
The Council will revise its Groundfish Advisory Panel to include three representatives that fish in each management area, as well as other interested parties.

Future Developments
One of the reasons for an area management system is to improve a sense of stewardship by establishing closer links between those interested in using and conserving resources in an area and the management system. This may be facilitated by establishing more direct opportunities for interested parties to develop management systems. For example, area governing bodies could be established that work with industry and the public to develop measures that the Council would review for consistency with applicable law and submits to NMFS for implementation. The Council may consider future revisions to its process that delegate authority for some management decisions in an area to other groups, subject to final Council and NMFS approval.

VMS Requirements
VMS is required for all vessels moving between areas within a single trip. This applies to movement between areas in options 1-4 but not areas in option 5.

Possible Modifications
This option relies on a hard TAC in each area to insure biological objectives are met. If stock conditions change, the TAC will result in closure at a different time, but the measures will not be changed until a later Council action. Selection of a different rebuilding program will have the same result.

If trip limits are established as a management measure in any area, the NMFS Regional Administrator has the authority to adjust haddock trip limits during the fishing year, as described below:

Adjustment of the haddock trip limit
The Regional Administrator may adjust the TAC for haddock at any time prior to or during the fishing year to prevent exceeding the target TAC or allow harvesting up to 75% of the target TAC, as described below.

(A) Adjustment to haddock trip limit to prevent exceeding target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that the Regional Administrator determines will prevent exceeding the target TAC. This adjustment may be made if the Regional Administrator projects that the target TAC for haddock will be exceeded, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

(B) Adjustment of the haddock trip limit to allow harvesting up to 75 percent of target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that is determined to be sufficient to allow harvesting of at least 75 percent of the target TAC, but not to exceed the target TAC. This adjustment may be made if the Regional Administrator projects that that less than 75 per cent of the target TAC for haddock will be harvested by the end of the fishing year, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

4.1.5.5 Alternative 4 – "Hard" Total Allowable Catch (TAC)

The Council considered adopting a "hard" TAC management system. This alternative was not selected. The Council is concerned that this alternative would lead to a derby fishery and either excessive discards (if possession of a species is prohibited when a TAC is reached) or a sacrifice in yield from healthy stocks (if groundfish fishing is prohibited when a TAC is reached). In addition, managing twenty stocks, with overlapping geographic ranges, would be administratively difficult. A past Council attempt to manage the fishery with a hard TAC was an abject failure. It id not protect the resource and did not allow for development of a stable industry.

Affected Stocks

TACs will be applied to stocks in the multispecies FMP on a single or multi-stock basis. TACs will be specified and monitored for the commercial fishery. TACs may also be specified for the recreational fishery if the recreational harvest is a significant part of the total catch. If there is a recreational TAC, it will be monitored separately from the commercial TAC. There are two options for applying TACs to the multispecies fishery. In all options, TACs will be set so that incidental catch fisheries are not inadvertently closed as a result of reaching one of the TACs early in the fishing year.

If enough information is available, TACs for a species will be based on total commercial removals which include both commercial landings and discards. This requires sufficient information to adequately estimate and monitor discards. While for some stocks such information is already available and is included in stock assessments, for other stocks it is not. When discards cannot be accurately estimated, then the TAC is specified for and based on landings.

Hard TAC with Input Controls

This alternative combines a hard TAC with additional input controls. Any of the options for administering the TACs described below (sections 0 and 0) may be chosen with this option. The input controls will be based on one of three options:

Option 1: Measures adopted by Alternative 2 (see section 4.1.5.3)
Option 2: Measures implemented by the Framework 33 court order, incorporating any changes and as effective on April 30, 2004
Option 3: The measures in the No Action Alternative (measures in place during FY 2001) with a hard TAC. The No Action Alternative measures are described in section 4.1.5.1 and are not repeated here.

TAC Administration Option 1

Prior to the beginning of the fishing year, the Council and/or the Regional Administrator will set a "hard" TAC for specified stocks and target TACs for all others. One of two options will be used for determining which stocks have a TAC:

Option A: All groundfish stocks will have a hard TAC
Option B: Groundfish stocks that are subject to overfishing, or where fishing mortality is higher than the fishing mortality adopted by a formal rebuilding program will have a hard TAC

For each stock with a hard TAC, more stringent regulations will be implemented as the TAC is approached. These regulations will become effective when projections indicate a certain percentage of the TAC will be reached. This percentage can be adjusted by framework action, as can the regulations that will be implemented. The purpose of the additional regulations is to prevent the TAC from being caught and to encourage fishermen to target other stocks. One example of more stringent regulation is a lower trip limit. The draft amendment included example trip limits that could be implemented at these levels. The trip limit for a particular stock depends on the level of its implementation (that is, at 70% or 90% of the TAC), the selected rebuilding strategy and rebuilding period, whether the TAC is specified on an annual basis or on a trimester basis, and the number of DAS available. The tables provided show the TACs for rebuilding most stocks by 2014 assuming DAS use is similar to FY 2002. These TACs will be recalculated based on the most recent stock status if this alternative is selected, and based on actual DAS allocations. The Regional Administrator may adjust these trip limits as necessary to allow harvesting the TAC.

When the TAC is projected to be reached, either fishing in a stock area or possession of that species in the stock area will be prohibited, as described in the alternatives in section 0. GOM haddock, GB haddock, Pollock, redfish, GOM winter flounder, GB winter flounder, northern and southern windowpane flounder, GB yellowtail flounder and witch flounder are not predicted to reach the TAC threshold. Results are shown based on the constant mortality rebuilding strategy and the phased F rebuilding strategy using both FY 2002 and FY 2001 effort control measures (DAS allocations).

The draft amendment included example trip limits that might be implemented under this alternative. These examples are not repeated here. If this hard TAC alternative were adopted in the future, then the trip limits would have to be recalculated based on current stock conditions, rebuilding strategy selected, and the suite of effort controls (if any) that are in effect. The trip limits from the draft amendment can be found in the analysis of the biological impacts of this alternative, section 5.2.6.6.3.

TAC Administration Option 2
Establish an aggregate TAC for multiple stocks that are not overfished and for which overfishing is not occurring and are not in a current rebuilding program. Establish a separate hard TAC for each of the other stocks managed under the multispecies plan which are in an overfished condition, are rebuilding or for which overfishing is occurring. (An aggregate TAC for multiple stocks will *not* be equal to the sum of individual TACs for those stocks.) The aggregate stock and separate stock TACs will be determined based on the most current stock assessment information as provided by NMFS/NEFSC and adjusted based on the periodic adjustment schedule adopted in Amendment 13.

Discussion: Combined or aggregate TACs may work well for healthy stocks that share similar life history characteristics. For stocks that share similar habitats and/or reproductive behaviors it is difficult to direct fishing on one stock without also catching significant quantities of the other. If separate TACs are applied to such closely associated stocks it will be necessary to establish a bycatch TAC for one of the stocks once the TAC of the other is reached. This approach may address some of the concerns about increased discards and works to simplify management under a hard TAC regime.

A disadvantage of this approach is that there is potential for serial depletion of stocks managed under an aggregate TAC. If the market values for species/stocks managed within an aggregate TAC differ significantly, the more valuable of these species/stocks would be harvested more aggressively than those of lesser value. This may lead to increased discards as stocks managed under an aggregate TAC are targeted unevenly.

United States/Canada Resource Sharing Agreement
If the US/Canada resource sharing agreement is incorporated into Amendment 13, Georges Bank cod, haddock and yellowtail TACs will be based on the formula defined in the agreement.

TAC Management Schedule
Option 1 - Annual TAC
TACs will be established for each fishing year and will be monitored on that basis.

Option 2 – Annual TAC with Target (Trimester) TACs
Hard TACs will be established for each fishing year. The total annual hard TAC will be monitored by trimester target TACs apportioned based on historic catch pattern (to remain sensitive to seasonal and marketing issues).

Each trimester will be four months in duration. For example, if the fishing year extends from January 1 to December 31, the trimesters will be divided as follows:

1st trimester: January 1-April 30
2nd trimester: May 1-August 31
3rd trimester: September 1-December 31

The actual trimesters would be different for a fishing year beginning July 1 or October 1. The target TACs, or percentages of total TAC allocated in each trimester, will be based on average monthly landings for each stock over the period from 1996-2001.

Option 3 – Annual TAC with Hard Trimester TACs (Preferred Alternative)
TACs will be established for each fishing year. The total annual TAC will be monitored by trimester hard TACs apportioned based on historic catch pattern (to remain sensitive to seasonal and marketing issues). The trimester TACs are "hard" TACs in this option – catching the trimester TAC will result in closure of a stock area or prohibition on possession as described in section 0.

The actual trimesters would be different for a fishing year beginning July 1 or October 1. The TACs, or percentages of total TAC allocated in each trimester, will be based on average monthly landings for each stock over the period from 1996-2001.

Setting the TAC and TAC Adjustment
Option 1 – Annual adjustment
The TAC will be reviewed on an annual basis and a new TAC will be applied at the beginning of each fishing year. Even if a biennial review and framework adjustment process is established in Amendment 13, the PDT will update the TAC each year based on the SAFE/MSMC report.

Discussion: One difficulty with this approach is that adjusting the TACs on a yearly basis would require the appropriate NEPA document to be prepared each year.

Option 2 – Biennial adjustment
The TAC will be reviewed on a biennial basis and a new TAC will be applied at the beginning of every other fishing year. The TAC set each year will either be altered from the previous year's TAC based on an (unscheduled) review process or renewed unchanged. If a biennial periodic review process is established in Amendment 13, TACs will be renewed unchanged at the beginning of a non-adjustment fishing year and may be adjusted every other year.

Rationale: Adjusting the TAC every other year would allow additional time to monitor the success of the previous TAC. By understanding how the stock is affected by the specific TAC that was set, more accurate revisions to the TAC will be possible when it is adjusted. Appropriate NEPA documents would only need to be prepared every other year if this alternative is selected.

Monitoring the TAC
In order to effectively monitor usage of the TAC, the following information is needed on a daily basis:

- *catch* composition for each trip (including what species are caught, where they are caught, and an estimation of how much was caught) in addition to landings data
- other information needed to monitor the TAC, as determined by the Regional Administrator

The monitoring schedule should be based on the size of the total TAC and how quickly TACs are being approached. As the total TAC is reduced, the rate of catch monitoring should be increased. For example, monitor the use of the TAC biweekly in the first trimester, weekly in the second trimester and daily in the third trimester. Frequency of reporting should be increased significantly, especially as the TAC is being approached.

Some degree of observer coverage will be required for the purpose of monitoring discards. The NMFS Northeast Regional Office will determine the level of observer coverage (see section 3.4.10).

Reporting System Options
Reporting system options, including requirements for VMS, are specified in section 3.4.14.

Reaching the Total TAC
Option 1 – Closure of Stock Area
When it is projected that 100 percent of the TAC for a stock will be caught, NMFS will close the area where the stock is caught to all gear capable of catching that species. Gear used to catch other species will still be allowed to fish in the area. As an example, if an area is closed to stop the catch of yellowtail flounder, hook gear may still be allowed in the area. If techniques or modifications to gear can be developed that prevent catching a species, that specific employment of a prohibited gear may be allowed. For example, the raised footrope trawl has been repeatedly demonstrated to limit catches of yellowtail flounder and received approval as an exempted/certified bycatch fishery. If an area is closed to trawl gear because the yellowtail flounder TAC is caught, fishing could be allowed using a raised footrope trawl.

The area closed will be based on the area that accounted for ninety percent of the reported (VTR) landings in prior years. Areas that will be closed for each stock are shown in Table 31. These areas are based on statistical areas. The Regional Administrator is authorized to further narrow the areas closed based on additional information. For example, some stocks are found in a narrow depth range and it may be possible to use this information to limit the area that must be closed.

SPECIES	STOCK	Area/Gear Prohibited When TAC is Caught	
		Statistical Areas	**Gear**
Cod	GB	521,522,525,526,561	Trawl, gillnet, longline/hook
	GOM	513,514,515	Trawl, gillnet, longline/hook
Haddock	GB	521,522,561	Trawl, gillnet, longline/hook
	GOM	512,513,514,515	Trawl, gillnet, longline/hook
Yellowtail Flounder	GB	522,525,561,562 (all)	Trawl, gillnet
	SNE/MA	537,539,612,613	Trawl, gillnet
	CC/GOM	514,521	Trawl, gillnet
American Plaice		512,513,514,515,521,522	Trawl
Witch Flounder		512,513,514,515,521,522	Trawl
Winter Flounder	GB	521,522,562	Trawl
	GOM	514	Trawl, gillnet
	SNE/MA	521,526,537,539,612,613	Trawl
Redfish		513,514,515,521,522,561	Trawl
White Hake		511,512,513,514,515,521,522,525,561,613,616	Trawl, gillnet, longline/hook
Pollock		513,514,515,521,522,561	Gillnet, trawl, longline/hook
Windowpane Flounder	North	513,515,521,522,525,562	Trawl
	South	526,537,539,612,613	Trawl
Ocean Pout		*To be developed*	*To be developed*
Atlantic Halibut		*To be developed*	*To be developed*

Table 31– Gears prohibited in specific areas when a TAC is caught. See Figure 8 to reference statistical areas

Rationale: Some stock areas cover broad areas, even though the species may not be caught throughout the area. By limiting closures to areas where most of the stock is caught, the stock is protected while allowing opportunities to fish for other stocks. For example, the GB cod stock area stretches from Georges Bank to New Jersey, but very little cod is caught west of 70W. Other species are caught in narrow depth bands within a stock area. Similarly, there is no reason to restrict gear that does not catch a particular species from an area when the TAC is caught. This may also encourage development of more selective fishing techniques so that fishing can continue when the TAC for one species is caught.

Option 2 – Prohibition on Retention (Preferred Alternative)
When it is projected that 100 percent of a TAC for a stock will be caught, possession of that species will be prohibited in the stock area. Vessels transiting that area with the same species caught from different stock areas must have all gear properly stowed and cannot fish in the area.

Consequences for exceeding target (trimester) TACs and total (yearly) TACs

Exceeding TACs
Overages of the TACs in any trimester (whether a "hard" or target trimester TAC) will result in a deduction from the following year's TAC of the same amount in the same trimester. If the total TAC for the year is exceeded, the overage will be deducted from the following year's TAC.

Action if TAC is not caught
TACs are calculated based on a desired fishing mortality rate. If a TAC is not caught over an annual period, the underage cannot be automatically shifted into the following year. Adding the previous year's underage to a TAC based on a fishing mortality rate could result in overfishing. If the TAC is not caught, the stock will rebuild more quickly and the result will be a higher TAC in later years.

Within a fishing year, if a trimester specific TAC is not caught, the underage will be rolled over into the following trimester.

Adjustment of the haddock trip limit
The Regional Administrator may adjust the TAC for haddock at any time prior to or during the fishing year to prevent exceeding the target TAC or allow harvesting up to 75% of the target TAC, as described below.

(A) Adjustment to haddock trip limit to prevent exceeding target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that the Regional Administrator determines will prevent exceeding the target TAC. This adjustment may be made if the Regional Administrator projects that the target TAC for haddock will be exceeded, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

(B) Adjustment of the haddock trip limit to allow harvesting up to 75 percent of target TAC – At any time prior to or during the fishing year NMFS may adjust, through publication of a notification in the Federal Register, the trip limit per DAS and/or the maximum trip limit to an amount that is determined to be sufficient to allow harvesting of at least 75 percent of the target TAC, but not to exceed the target TAC. This adjustment may be made if the Regional Administrator projects that that less than 75 per cent of the target TAC for haddock will be harvested by the end of the fishing year, based on harvesting rates during previous fishing years (if effort is not expected to change) or, if there is sufficient information to do so, based on harvesting rates during the current fishing year.

Possible Modifications
Changes to the necessary fishing mortality reduction will not have any impacts on the measures in this alternative.

4.1.5.6 Recreational Measures

Option 1 – FW 33 Settlement Agreement
The recreational/party charter measures implemented through the FW 33 settlement agreement (as modified in July 2003) will be extended. These are:

Minimum size: cod 23 inches, haddock 21 inches
Possession limit:
Private recreational vessels: 10 cod/haddock, except 5 cod GOM December 1 – March 31
Party/charter: 10 cod GOM April 1 through November 30; 5 cod creel limit in GOM December 1-March 31

Vessels intending to charter/party fish in the GOM closed areas must declare into charter/party fishery for the duration of the closure of for three months, whichever is greater

All other measures in place during fishing year 2001 continue to apply.

This option was not selected because of concerns it would have negative economic impacts on the party/charter sector.

Option 2
Bag limit for all private recreational vessels: 10 cod per person per day
Bag limit for party/charter vessels in the GOM: 10 cod per person per day
(Note there is no bag limit for haddock.)

Minimum cod size: 23 inches
Minimum haddock size: 19 inches

Closed season: no recreational/party/charter fishing in the GOM, December through March

All other measures in place during fishing year 2001 continue to apply.

This option was not selected because of a concern the closed season in the GOM would have severe economic impacts for party/charter vessels.

4.1.6 Measures to Minimize, to the Extent Practicable, the Adverse Effects of Fishing on Essential Fish Habitat

4.1.6.1 No Action (No additional habitat-related management measures)

This alternative retains the groundfish year-round closed areas that were in effect during fishing year 2001 prior to the settlement agreement *(CLF et al. v. Evans et al.)*. Under this alternative, no new management measures will be implemented as part of Amendment 13 that are specifically intended to protect essential fish habitat or reduce impacts associated with fishing.

The existing management measures, including year-round closed areas, trip/landing limits, gear restrictions and effort limitations, are acknowledged to have provided habitat benefits. It is important to note, however, that the year-round closed areas were intentionally not closed for habitat and/or EFH protection purposes, and therefore do not constitute habitat closures.

This alternative was not selected because it does not address M-S Act requirements to minimize, to the extent practicable, the adverse effects of fishing on EFH. The Council believes that there are additional measures that are practicable that will minimize any adverse effects.

4.1.6.2 Alternative 3 - Closed Areas Designed to Protect Hard-Bottom Habitats

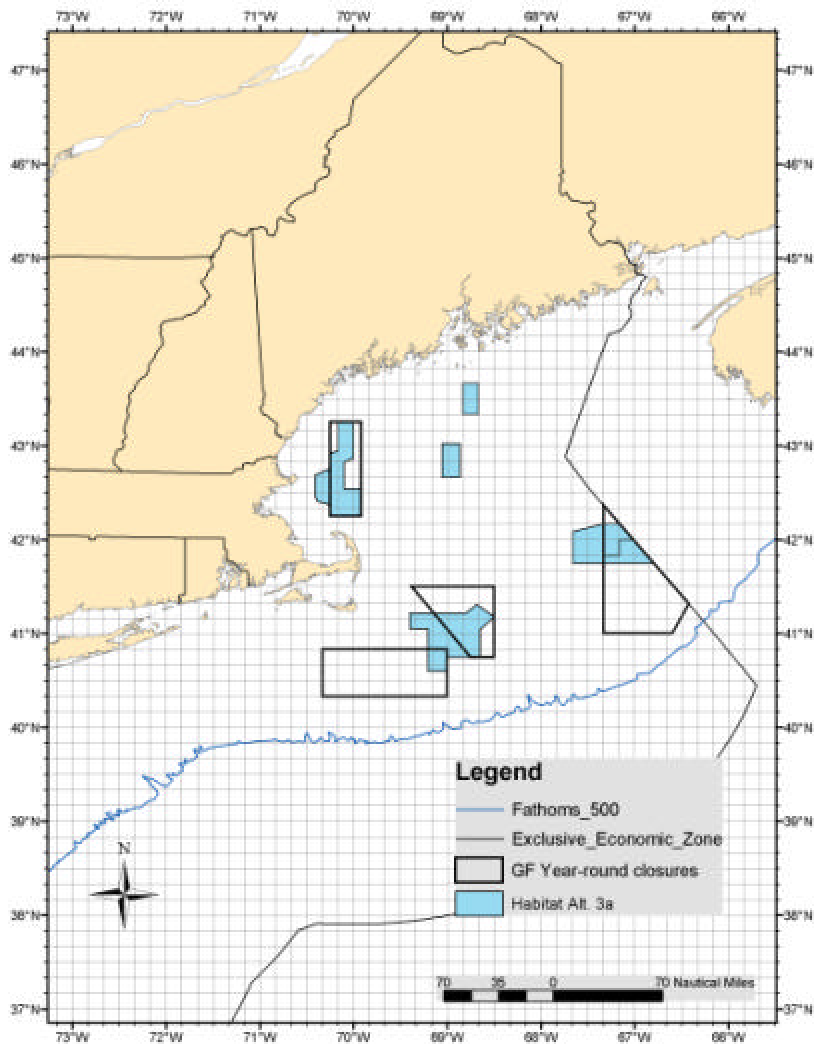
In this alternative, areas both inside and outside of the existing groundfish closures are identified for habitat closure to better protect complex hard-bottom and other sensitive habitats. The Council approved this alternative with two versions of the Western Gulf of Maine closed area. These have been incorporated as two options:

- Alternative 3A, which has a larger extension of the WGOM to the west.
- Alternative 3B, which has a smaller extension of the WGOM closure to the west.

Figure 27 and Figure 28 provide a graphical representation of the proposed habitat closure options and coordinates for the boundaries of those areas.

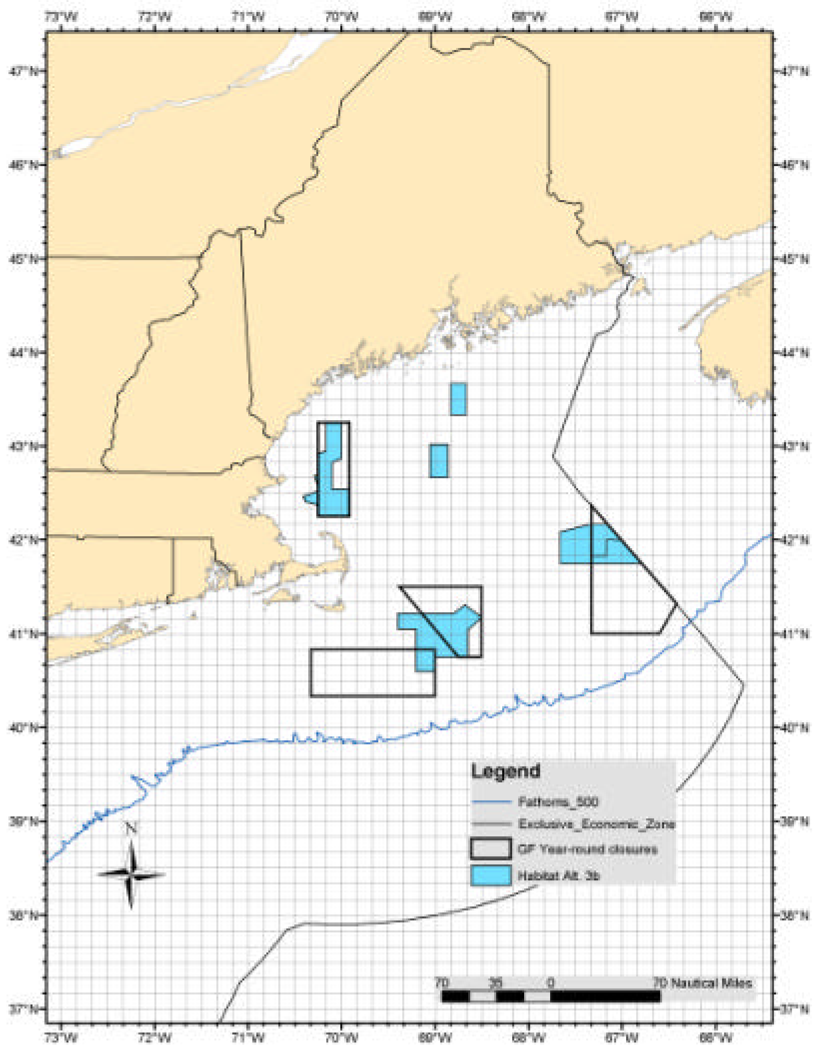
4.1.6.3 Alternative 4 –Closed Areas Designed to Protect Hard-Bottom Habitats

Habitat closure areas in this alternative are derived from areas proposed in alternative 3 that overlap modified groundfish closed areas originally proposed as a stock rebuilding alternative for Amendment 13 of the NEFMC Multispecies Fishery Management Plan. While that alternative has been considered and rejected for stock rebuilding purposes, the Council did not expressly reject the closures proposed in Alternative 4 for habitat management purposes. Because these modifications were rejected for groundfish management purposes, adoption of habitat closed area alternative 4 would not affect the boundaries of the existing groundfish closures. The closures proposed in this alternative are intended to better protect complex hard-bottom and other sensitive habitats from any adverse impacts associated with fishing. They are shown in Figure 18.



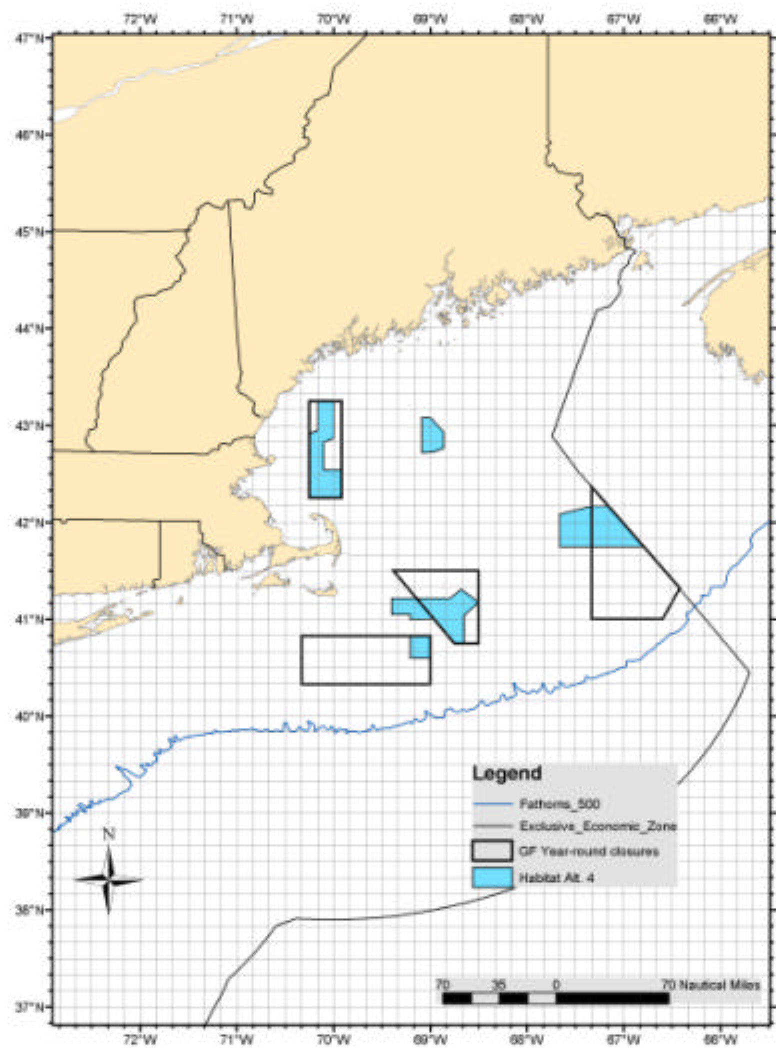
	Point #	LONGITUDE deg	LONGITUDE min	LONGITUDE sec	LATITUDE deg	LATITUDE min	LATITUDE sec
Habitat Area I	1	69	24	0	41	13	0
	2	68	48	0	41	13	0
	3	68	41	0	41	18	30
	4	68	30	0	41	10	30
	5	68	39	0	41	2	30
	6	68	39	0	40	45	0
	7	69	0	0	40	36	0
	8	69	0	0	40	36	0
	9	69	12	30	40	36	0
	10	69	12	30	41	3	0
	11	69	24	0	41	3	0
Habitat Area II	1	67	40	0	42	5	0
	2	67	20	0	42	10	0
	3	67	9	35	42	10	0
	4	66	47	48	41	45	0
	5	67	40	0	41	45	0
Cashes Habitat	1	69	3	22	43	1	14
	2	68	51	56	43	1	14
	3	68	51	56	42	39	46
	4	69	3	22	42	39	46
Jeffrey's Habitat	1	68	50	0	43	40	0
	2	68	40	0	43	40	0
	3	68	40	0	43	20	0
	4	68	50	0	43	20	0
WGOM Alt. 1	1	70	10	0	43	15	0
	2	70	0	0	43	15	0
	3	70	0	0	42	52	0
	4	70	6	4	42	49	33
	5	70	6	4	42	32	30
	6	69	55	0	42	32	30
	7	69	55	0	42	15	0
	8	70	15	0	42	15	0
	9	70	15	0	42	20	27
	10	70	17	0	42	23	0
	11	70	23	0	42	24	18
	12	70	24	42	42	27	44
	13	70	24	42	42	41	18
	14	70	15	0	42	45	14
	15	70	15	0	42	55	0
	16	70	10	0	42	57	0

Figure 27 - Map and Coordinates for Habitat Alternative 3a (current groundfish closed areas included for reference)



	Point #	LONGITUDE deg	LONGITUDE min	LONGITUDE sec	LATITUDE deg	LATITUDE min	LATITUDE sec
Habitat Area I	1	69	24	0	41	13	0
	2	68	48	0	41	13	0
	3	68	41	0	41	18	30
	4	68	30	0	41	10	30
	5	68	39	0	41	2	30
	6	68	39	0	40	45	0
	7	69	0	0	40	36	0
	8	69	0	0	40	36	0
	9	69	12	30	40	36	0
	10	69	12	30	41	3	0
	11	69	24	0	41	3	0
Habitat Area II	1	67	40	0	42	5	0
	2	67	20	0	42	10	0
	3	67	9	35	42	10	0
	4	66	47	48	41	45	0
	5	67	40	0	41	45	0
Cashes Habitat	1	69	3	22	43	1	14
	2	68	51	56	43	1	14
	3	68	51	56	42	39	46
	4	69	3	22	42	39	46
Jeffrey's Habitat	1	68	50	0	43	40	0
	2	68	40	0	43	40	0
	3	68	40	0	43	20	0
	4	68	50	0	43	20	0
WGOM Alt. 2	1	70	0	0	43	15	0
	2	70	0	0	42	52	0
	3	70	6	4	42	49	33
	4	70	6	4	42	32	30
	5	69	55	0	42	32	30
	6	69	55	0	42	15	0
	7	70	15	0	42	15	0
	8	70	15	0	42	20	27
	9	70	17	0	42	23	0
	10	70	23	0	42	24	18
	11	70	24	42	42	27	44
	12	70	15	0	42	31	27
	13	70	15	0	42	33	50
	14	70	17	35	42	41	0
	15	70	15	0	42	41	35
	16	70	15	0	42	55	0
	17	70	10	0	42	57	0
	18	70	10	0	43	15	0

Figure 28 - Map and Coordinates for Habitat Alternative 3b (current groundfish closed areas included for reference)



	Point	LONGITUDE deg	LONGITUDE min	LATITUDE deg	LATITUDE min
GOM	1	70	9	43	15
	2	70	0	43	15
	3	70	0	42	51
	4	70	6	42	49
	5	70	6	42	32
	6	69	54	42	32
	7	69	54	42	15
	8	70	15	42	15
	9	70	15	42	20
	10	70	15	42	54
	11	70	10	42	57
CAI	1	69	24	41	13
	2	68	47	41	13
	3	68	40	41	18
	4	68	30	41	10
	5	68	39	41	2
	6	68	39	40	45
	7	68	45	40	45
	8	68	57	41	0
	9	69	12	41	0
	10	69	12	41	2
	11	69	24	41	2
CAII	1	67	40	42	4
	2	67	20	42	10
	3	67	9	42	10
	4	66	47	41	45
	5	67	40	41	45
Nantucket	1	69	0	40	50
	2	69	0	40	36
	3	69	12	40	36
	4	69	12	40	50
Cashes	1	69	5.8	43	4.4
	2	68	59.5	43	4.4
	3	68	51.5	42	55.6
	4	68	51.5	42	45.6
	5	68	58.3	42	43.3
	6	69	5.8	42	43.1

Figure 29 - Map and Coordinates for Habitat Alternative 4 (current groundfish closed areas included for re ference)

4.1.6.4 Alternative 5 - Closed areas designed to protect EFH and balance fishery productivity

This alternative establishes closed areas that balance the protection of EFH and fishery productivity. Closed areas were determined on the basis of a model that assigned a value for EFH importance and fishery productivity (in the scallop, groundfish, and monkfish fisheries) in each ten minute square from the southern border of Canada to the northern border of South Carolina. Closed areas were then designated based on four decision criteria for each ten minute square: 1) reliance of the stocks on bottom habitat (life history considerations), 2) stock status, 3) relative value to the fisheries and 4) vulnerability of bottom habitat. The model identified one closed area, based on closure areas of more than eight (or nine, depending on the closure shape) contiguous ten minute squares, for each of the management areas (e.g. Gulf of Maine, Georges Bank, Southern New England and Mid-Atlantic). The following four options were developed:

Alternative 5A: EFH/Productivity tradeoffs using the original working group species EFH weights with equal emphasis given to scallop productivity and the combined weighted productivity of 37 other managed species.

Alternative 5B: Total EFH value only, using revised species EFH weights (omitting relative importance to the fishery as a factor), with no productivity tradeoff.

Alternative 5C. EFH/Productivity tradeoffs using the revised species EFH weights with equal emphasis given to scallop productivity and the combined weighted productivity of the other 37 managed species.

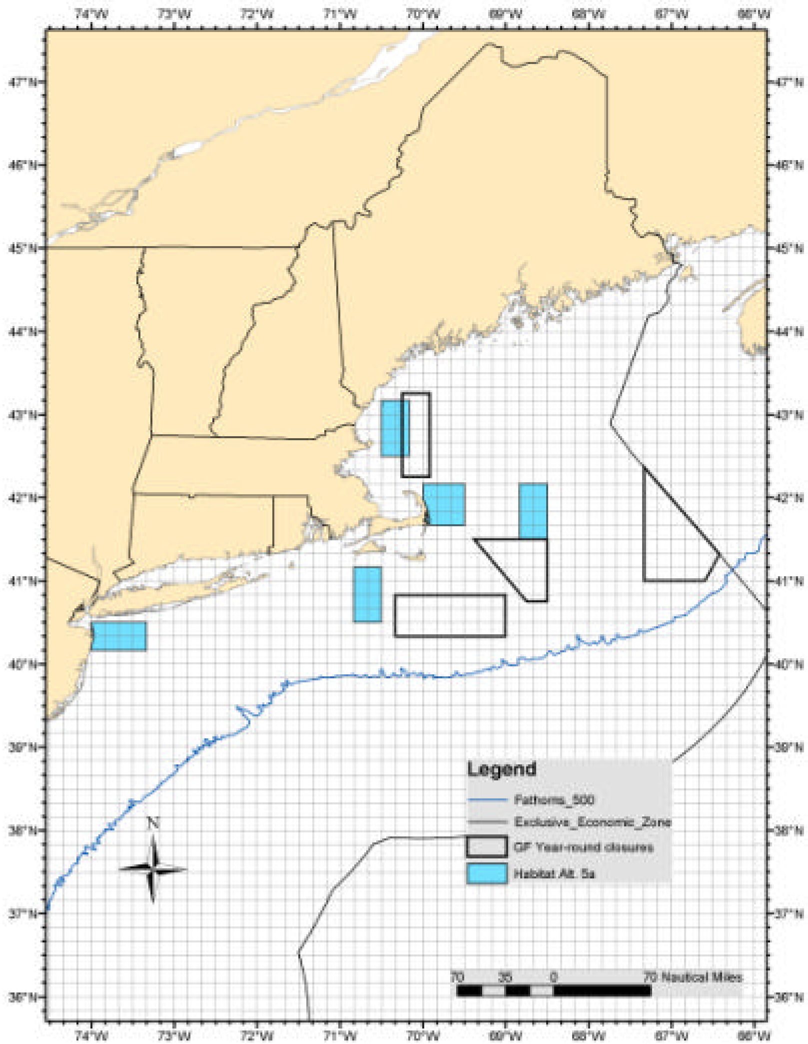
Alternative 5D. EFH/Productivity tradeoffs using the revised species EFH weights and productivity for each of the 37 managed species, considered individually.

Figure 30 through **Figure 33** display maps and coordinates for these closures. See Appendix V for a detailed description of the model used to determine these closure areas.

4.1.6.5 Alternative 6 – Habitat Closures consistent with the Framework Adjustment 13 Scallop Closed Areas Access Program

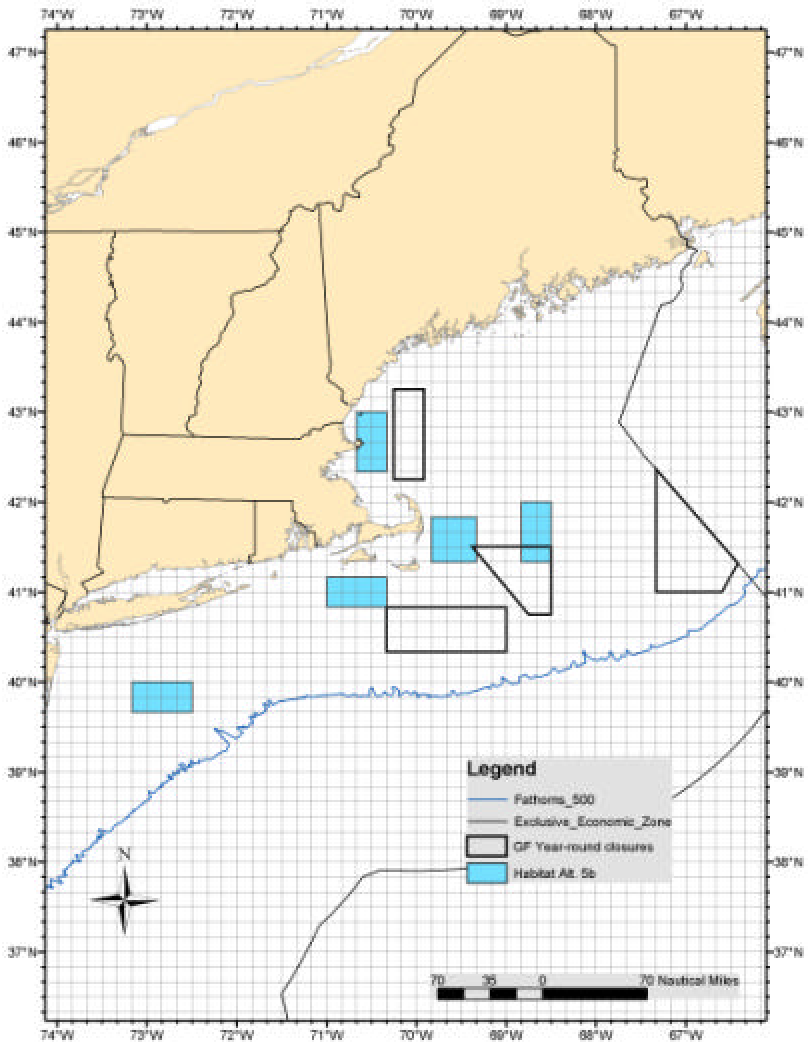
In this alternative the year-round groundfish closed areas (WGOM, , CA I, CA II and NLCA) that were in place during the 2001 fishing year are considered habitat closures with the exception of those areas opened under the Scallop FW 13 Closed Area Access Program.

See Figure 34 for a map of the closures.



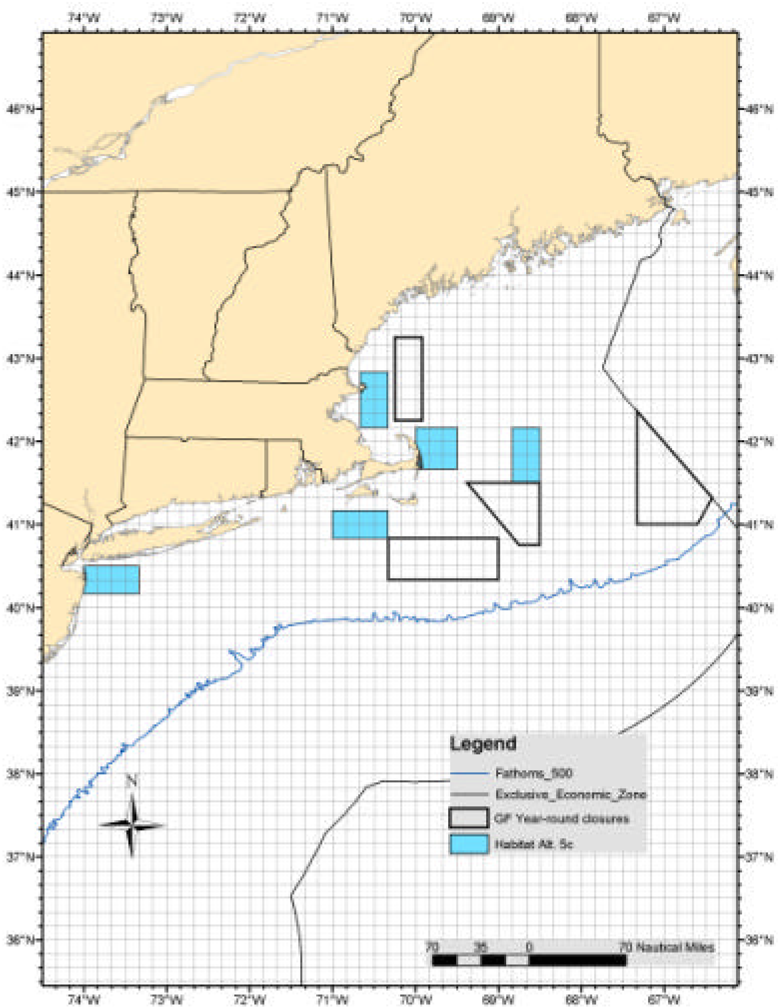
	Point #	LATITUDE deg	LATITUDE min	LONGITUDE deg	LONGITUDE min
GB					
	1	42	10	-69	10
	2	42	10	-69	30
	3	41	30	-69	30
	4	41	30	-69	10
GOM					
	1	43	10	-71	30
	2	43	10	-71	50
	3	42	30	-71	50
	4	42	30	-71	30
GSC					
	1	42	10	-70	0
	2	42	10	-70	30
	3	41	40	-70	30
	4	41	40	-70	0
MA					
	1	40	30	-74	0
	2	40	30	-74	40
	3	40	10	-74	40
	4	40	10	-74	0
SNE					
	1	41	10	-71	10
	2	41	10	-71	30
	3	40	30	-71	30
	4	40	30	-71	10

Figure 30 - Map and Coordinates for Habitat Alternative 5a (current groundfish closed areas included for reference)



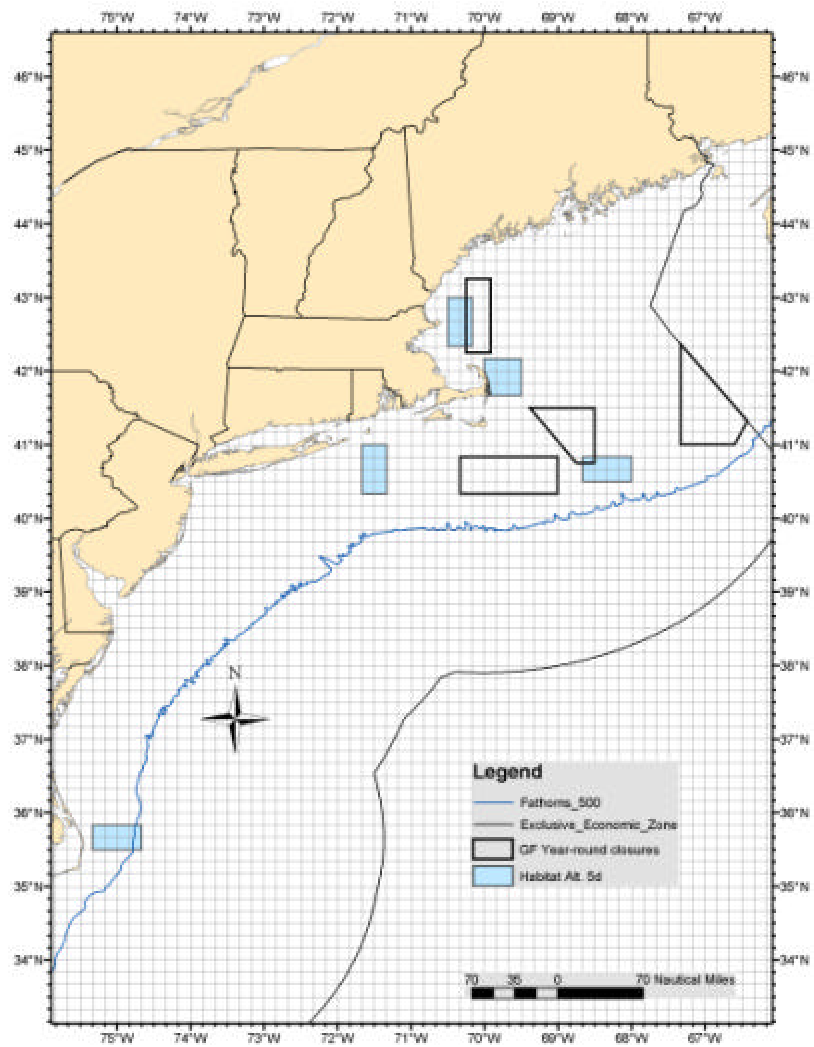
	Point #	LATITUDE deg	LATITUDE min	LONGITUDE deg	LONGITUDE min
GB					
	1	42	0	-69	10
	2	42	0	-69	30
	3	41	20	-69	30
	4	41	20	-69	10
GOM					
	1	43	0	-71	20
	2	43	0	-71	40
	3	42	20	-71	40
	4	42	20	-71	20
GSC					
	1	41	50	-70	10
	2	41	50	-70	40
	3	41	20	-70	40
	4	41	20	-70	10
MA					
	1	40	0	-74	50
	2	40	0	-73	30
	3	39	40	-73	30
	4	39	40	-74	50
SNE					
	1	41	10	-71	0
	2	41	10	-71	40
	3	40	50	-71	40
	4	40	50	-71	0

Figure 31 - Map and Coordinates for Habitat Alternative 5b (current groundfish closed areas included for reference)



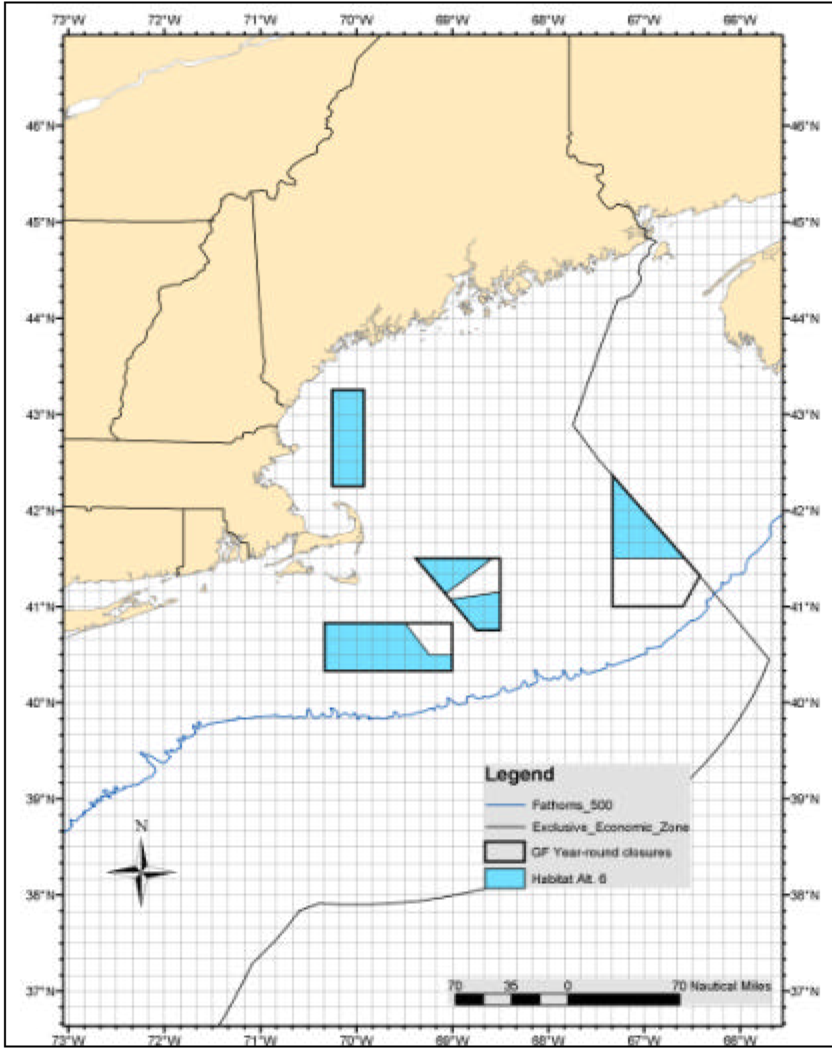
	Point #	LATITUDE deg	LATITUDE min	LONGITUDE deg	LONGITUDE min
GB					
	1	42	10	-69	10
	2	42	10	-69	30
	3	41	30	-69	30
	4	41	30	-69	10
GOM					
	1	42	50	-71	20
	2	42	50	-71	40
	3	42	10	-71	40
	4	42	10	-71	20
GSC					
	1	42	10	-70	0
	2	42	10	-70	30
	3	41	40	-70	30
	4	41	40	-70	0
MA					
	1	40	30	-74	0
	2	40	30	-74	40
	3	40	10	-74	40
	4	40	10	-74	0
SNE					
	1	41	10	-71	0
	2	41	10	-71	40
	3	40	50	-71	40
	4	40	50	-71	0

Figure 32 - Map and Coordinates for Habitat Alternative 5c (current groundfish closed areas included for reference)



	Point #	LATITUDE deg	LATITUDE min	LONGITUDE deg	LONGITUDE min
GB					
	1	40	50	-69	20
	2	40	50	-68	0
	3	40	30	-68	0
	4	40	30	-69	20
GOM					
	1	43	0	-71	30
	2	43	0	-71	50
	3	42	20	-71	50
	4	42	20	-71	30
GSC					
	1	42	10	-70	0
	2	42	10	-70	30
	3	41	40	-70	30
	4	41	40	-70	0
MA					
	1	35	50	-76	40
	2	35	50	-75	20
	3	35	30	-75	20
	4	35	30	-76	40
SNE					
	1	41	0	-72	20
	2	41	0	-72	40
	3	40	20	-72	40
	4	40	20	-72	20

Figure 33 - Map and Coordinates for Habitat Alternative 5d (current groundfish closed areas included for reference)



Area	Point #	LONGITUDE deg	LONGITUDE min	LATITUDE deg	LATITUDE min
CAI	1	69	1.2	41	4.5
	2	68	30	41	9
	3	68	30	40	45
	4	68	45	40	45
	5	69	23	41	30
	6	68	35	41	30
	7	69	4.3	41	8
CAII	1	67	20	42	22
	2	66	34.8	41	30
	3	67	20	41	30
Nantucket Lightship	1	69	0	40	20
	2	69	0	40	30
	3	69	14.5	40	30
	4	69	29.5	40	50
	5	70	20	40	20
	6	72	20	40	50
WGOM	1	69	55	42	15
	2	69	55	43	15
	3	70	15	43	15
	4	70	15	42	15

Figure 34 - Map and Coordinates for Habitat Alternative 6 (current groundfish closed areas included for reference)

4.1.6.6 Alternative 8 - Restrictions on the use of rockhopper and/or roller gear

This alternative will restrict the use of both rockhopper and roller trawl gear to protect areas of high-relief bottom where these gears are frequently employed. It is recognized that rockhopper and roller trawl gear function differently, and that they may interact differently with benthic habitats, but very little information is available with which to distinguish the effects of these gears on fishable bottom and/or EFH. Therefore, these two gears are treated equally for the purposes of this alternative.

Under this alternative, the restriction could extend throughout the Gulf of Maine (only), throughout the Gulf of Maine and Georges Bank, or throughout the entire range of the multispecies fishery and apply to anyone with a multispecies permit.

The following versions of this alternative are proposed. Listed from least restrictive to most restrictive:

8(a) - A prohibition on the use of any rockhopper and roller trawl gear with a diameter larger than the current maximum size (estimated to be between 31" and 36").

This alternative will freeze the maximum size of rockhopper and roller trawl gear at the maximum size currently in use. It is estimated that the maximum size of rockhopper and roller trawl gear currently being used in the New England region is from 31" to 36" in diameter. To more accurately pinpoint the current maximum size, the Council will contact fishermen and gear distributors in the New England region and assess the largest size rockhopper and roller gear that they currently use or stock and sell. Once the maximum allowable size is capped, the Council and NMFS is expected to research the specific effects of various sizes of rockhopper and roller trawl gear on a variety of important groundfish habitats. The Council will use this new information to determine whether the maximum allowable size should be further reduced, maintained at current levels, or eliminated (no size restriction). This research would also target the differences between rockhopper and roller gear, and whether differential size restrictions are a more appropriate management tool to minimize the effects of these gear types on EFH.

8(b) - A prohibition on the use of otter trawl groundgear with a diameter larger than 22"

This alternative prohibits the use of otter trawl groundgear with a diameter larger than 22 inches. Cookies or other types of groundgear configurations 22" or less in diameter, including rockhoppers and rollers, will be allowed. This alternative may be implemented through an immediate prohibition on all gear larger than 22" or through a step-wise reduction over time.

8(c) - A prohibition on the use of otter trawl groundgear with a diameter larger than 12", consistent with the existing maximum size limit in near shore portions of the Gulf of Maine.

This alternative prohibits the use of otter trawl groundgear with a diameter larger than 12". Cookies or other types of groundgear configurations, including rockhoppers and rollers, 12" in diameter or smaller will be allowed. This alternative may be implemented through an immediate prohibition on all gear larger than 12" or through a step-wise reduction over time. This alternative allows some configurations of small rockhopper and roller trawl gear to continue to be fished.

This alternative is an extension of a limit already in place in much of the western Gulf of Maine. Currently, the Council prohibits discs, rockhoppers and roller gear larger than 12" between 42° and 43° 30' North latitude from the shoreline out to either 70° or 69° 50' West longitude.

8(d) - A prohibition on the use of all rockhopper and roller trawl gear.

This would be a prohibition of all otter trawl configurations that employ ground gear with a diameter larger than 5" (the use of "cookies" with a diameter of 5" or less would be allowed).

This alternative prohibits the use of otter trawl groundgear with a diameter larger than 5”. Cookies 5” in diameter or smaller will be allowed. This alternative may be implemented through an immediate prohibition on all gear larger than 5”, or through a step-wise reduction over time. Five inches was identified as an option for the maximum size of cookies based on gear believed to be commonly stocked by gear distributors and used by fishermen in New England. Cookie size is reported to be somewhat variable and may range from 3” to 5” in diameter.

8(e) - A stepwise reduction in the maximum allowable size of otter trawl groundgear.
This could be considered a stand-alone alternative, or it could be incorporated into any of the reductions/prohibitions on rockhopper and roller gear size considered as alternatives above except for Alternative 8(a).

This alternative prohibits the use of any otter trawl groundgear with the following stipulations: From the start of the first new fishing year that begins after the implementation of Amendment 13, the maximum allowable diameter of groundgear will be reduced in stages over a period of six years from a maximum of 24” to a maximum of 5”. For example, if the first fishing year after implementation of Amendment 13 is May 1, 2003, the maximum size of groundgear will be 24” from May 1, 2003 until April 30, 2005. It will then be reduced to 12” from May 1, 2005 until April 30, 2007 and reduced again to 8” from May 1, 2007 until April 30, 2009. Thereafter, beginning May 1, 2009, the maximum size of groundgear will be 5”. The specific dates are examples of a reduction program that could be used. The program may be compressed over less time, stretched out over a longer timeframe, or the individual time period in which each size limit is in place could be varied. Also, the specific gear size increments could be different (e.g., from a maximum size of 30” to 24”, then to 18”, and then to 12”).

4.1.6.7 Alternative 9 - VMS on all groundfish vessels

This alternative requires VMS on all groundfish vessels, a critical step in obtaining high-resolution data on the distribution of fishing effort. The specifications on how best to implement this alternative will be left to the Groundfish Committee and PDT.

4.1.6.8 Alternative 10a

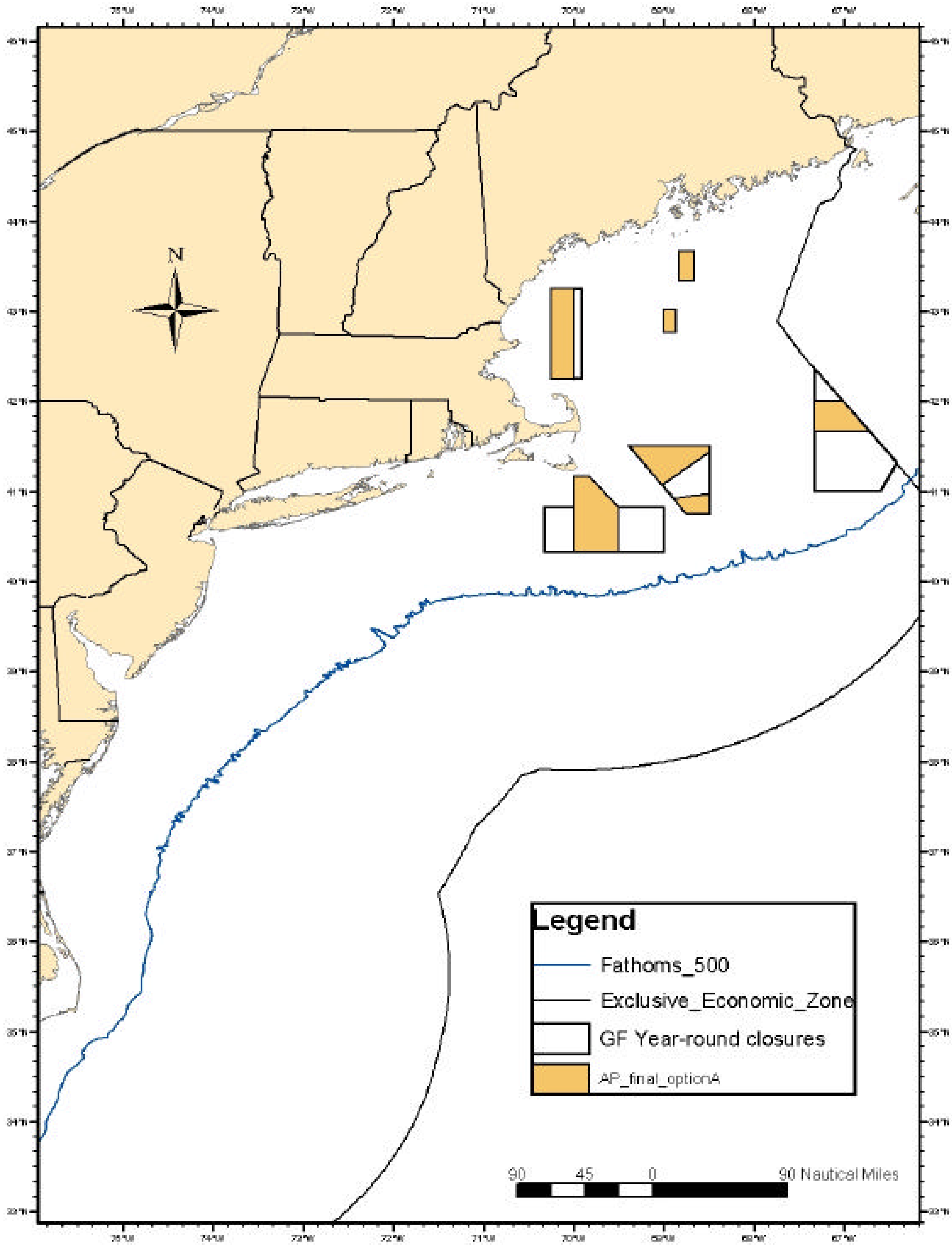


Figure 35 – Alternative 10a: Modified mortality closed areas and other proposed habitat closures including the *expanded* Cod HAPC in Closed Area II.

4.1.7 Other Issues

4.1.7.1 Northern Shrimp Fishery

The Council considered continuing to limit the Northern Shrimp fishery to fishing in the area inshore of the current small mesh fishery exemption line (see Figure 12). This option was not selected because the results of an experimental fishery suggest that shrimping can take place outside this area with little groundfish bycatch.

4.1.7.2 Tuna Purse Seine Access to Groundfish Closed Areas

Two alternatives to the proposed action were considered.

Option 1 – No action
Tuna purse seine vessels will be allowed in the WGOM closed area, seasonal (rolling) closed areas, and the Cashes Ledge Closed area. They will continue to be excluded from the Nantucket Lightship Closed Area and Closed Areas I and II.

This option would maintain the status quo. It does not address concerns of the tuna purse seine industry that their exclusion from three groundfish closed areas increases inefficiency, hampers their ability to pursue tuna, and potentially increases conflicts between different tuna fishing sectors. This option does, however, prevent the possibility that allowing tuna purse seine vessels access to the Nantucket Lightship Closed Area and Closed Areas I and II will increase bycatch of groundfish or cause adverse impacts on habitat. It was not selected because information from an experimental fishery showed that there was little risk of groundfish bycatch if this fishery operates in groundfish year round closed areas.

Option 2 – Access with Restrictions
Tuna purse seine gear is defined as an exempted gear for the purposes of the Northeast Multispecies FMP. Tuna purse seine vessels will be allowed into all groundfish closed areas subject to the following restrictions:

- Purse seine operations may not be conducted in any Habitat Area of Particular Concern (HAPC).
- In groundfish closed areas in the Gulf of Maine and Georges Bank (GOM/GB Regulated Mesh Area), fishing operations can only be conducted in areas that are 30 fathoms or more in charted depth. This restriction does not apply to the Nantucket Lightship Closed Area, or any future closed areas that may be developed in the southern New England and Mid-Atlantic regulated mesh areas unless specifically prohibited when implemented. Alternatively, the height of the net in use must be less than the depth of water.
- Vessels must direct sets to avoid fixed gear wherever possible.
- Vessels may not land or retain multispecies (including non-regulated multispecies or small mesh multispecies), and may not have gear on board capable of catching groundfish
- If the Regional Administrator determines that tuna purse seine vessels are adversely affecting habitat or groundfish stocks, individual vessels, or all vessels, may be prohibited from a closed area or areas.

Discussion: This option provides access to all groundfish closed areas. In the Gulf of Maine and Georges Bank, it provides additional protection to groundfish stocks and habitat by limiting fishing operations to depths that exceed the usual net size. It also prevents fishing operations in any HAPC. This balances the need for access to the closed areas with concerns that purse seine operations may inadvertently impact groundfish rebuilding or habitat.

This option was not selected because experimental results showed little need to impose these restrictions on purse seine vessels operating in the closed areas.

4.2 Alternatives Considered But Rejected

The following alternatives were considered but rejected by the Council because they were determined to not be reasonable. There was limited analysis of these alternatives in the draft amendment and DSEIS.

4.2.1 Constant Intended Catch Rate Rebuilding Strategy

This strategy would use a constant intended catch to rebuild the stock over time. Fishing mortality is reduced as the stock grows. When the stock achieves its target biomass, the formal rebuilding program, adopted because the stock was overfished, will be completed. Once the stock achieves the target biomass, fishing mortality targets will be based on the status determination criteria and MSY control rule. The appropriate constant catch will be based on observed stock conditions and recruitment. The catch for the rebuilding program may be adjusted if there are significant changes in stock status and recruitment from those used in the long-term projections used to estimate this fishing mortality.

This rebuilding strategy was rejected by the Council because it was determined that the costs of the strategy would likely outweigh its utility. A constant catch rebuilding strategy would likely increase discards and utilize increasingly restrictive measures over the course of the rebuilding time period. Additionally, this rebuilding strategy yields reduced long-term economic benefits as compared to the two other proposed strategies.

4.2.2 Measures Implemented August 1, 2002

As a result of a court order in the case of *Conservation Law Foundation et al. v. Evans et al.,* interim groundfish management measures were adopted on August 1, 2002. These measures were not designed to achieve the M-S Act requirements to rebuild overfished stocks and end overfishing. They were specifically designed to temporarily control fishing mortality on a few key stocks while Amendment 13 was developed. As analyzed in an Environmental Assessment (EA), the measures are not expected to achieve the necessary fishing mortality reductions to rebuild several stocks. (Indeed, for some stocks the EA concluded that fishing mortality may increase). Because these measures are not expected achieve M-S Act requirements, the Council does not consider them a reasonable alternative by themselves. In many cases, they serve as the basis for the development of additional management measures. Alternatives to address rebuilding requirements 1, 2, 3, 4, and 8 all incorporate many of the measures implemented August 1, 2002.

A summary of the measures, as implemented, can be found in Appendix 15.

4.2.3 Rebuilding Alternative Based on 50% Reduction in Used DAS

The following alternative begins with the assumption that unused DAS will be controlled This may be accomplished through one of the capacity alternatives, or through the recent settlement agreement. The alternative blends elements of the negotiated settlement agreement, DAS approach to management, and previous PDT alternatives. Unless changed by this alternative, the measures in place August 1, 2002 will continue.

This alternative was rejected by the Council after analysis showed that adverse social and economic impacts would be borne primarily by inshore fishermen from communities between Cape Cod and Maine. The Council believes this alternative is not consistent with National Standards 4 and 8. It also does not comply with the M-S Act requirement that harvest restrictions and recovery benefits be allocated fairly and equitably among commercial, recreational, and charter fishing sectors in the fishery. Restrictions focused on commercial inshore fishermen, who would have less of an opportunity to receive the benefits because of the large inshore closures.

4.2.3.1 Effort Controls

This option uses an actual 50% reduction in DAS as a major element in achieving the mortality reductions in the amendment. The 50% mortality reduction achieves most of the reduction necessary for GOM cod, GB cod, plaice, white hake, and Cape Cod yellowtail flounder. **An actual 50% reduction in DAS from fishing year 2000 and 2001 levels means that only 31,000 DAS will be fished under this option.**

There are a variety of possible ways to achieve the 50 percent DAS reduction. As noted earlier, this option assumes that one of the approaches to controlling unused effort suggested by the Capacity Committee will be adopted. **The smaller the pool of baseline DAS, the less the additional reduction that must be applied to each permit to reach the targeted 31,000 DAS.**

This concept can be illustrated by using information from the Capacity Committee report and other sources. This report includes alternatives for a variety of ways to calculate "effective" DAS – sometimes referred to as "baseline" DAS. Table 32 lists some of these alternatives, shows the number of DAS that result, and the additional reduction for each permit in order to achieve the 31,000 DAS target (ignoring any carry-over DAS). This final column is based on an across-the-board DAS reduction applied to each permit.

Effective DAS Calculation	DAS Allocated (approximate)	Additional reduction for each permit to achieve 31,000 DAS
None	143,300	78%
FW 33 Court Order Baseline	70,000	56%
FW 33 Court Order Baseline less 20%	56,000	45%
Original FW 33Court Order (average DAS used FY 1996 - 2000)	38,000	18%
Capacity Option 4: Maximum DAS FY 1994 - 1999	70,500	56%
Capacity Option 5: DAS used in FY 1999	53,500	42%
Capacity Option 6:	70,500	56%
Capacity Option 7: Maximum DAS FY 1996 – 1999	66,500	53%
Capacity Option 8a: Max. percentage used FY 1996 –1999 (no DAS if no fishing revenues)	72,700	57%
Capacity Option 8b: Max. percentage used FY 1996-1999 (no DAS if no finfish revenues)	71,500	56.5%

Table 32 – Additional DAS reduction necessary to achieve 31,000 DAS under various capacity reduction alternatives

4.2.3.1.1 Management Areas

There are no changes to existing management areas (that is, management areas will still be as revised by the FW 33 court order).

4.2.3.1.2 DAS Restrictions

Class A DAS (DAS that can be used on implementation of Amendment 13) reduced to 31,000.

In the SNE and MA regulated mesh areas, DAS are counted at a differential rate of 1.5:1 during the months of December through April.

Alternative 1A: As an option to avoid closing inshore blocks 124, 132, and 133 year round (see section 4.2.3.1.3.1). Vessels fishing in blocks 115, 116, 124, 125, 132, and 133 may be charged DAS at a 2:1 rate. *In the discussion of impacts (see section 5.0) this is referred to as Alternative 1A.* In order to enforce a 2:1 DAS counting in a particular area there may be a need to have a minimum time obligation to fish and a letter of authorization.

4.2.3.1.3 Closed Areas

See Figure 36 for a chart of the proposed closed areas.

4.2.3.1.3.1 Year-Round Closed Areas

The current year round closed areas are maintained indefinitely. This includes the Nantucket Lightship Closed Area, Closed Areas I and II, Cashes Ledge closure, and the Western Gulf of Maine Closed Area.

Some changes are made to the current year round closed areas:

Closed Area I: Thirty minute square Block 98 is added to the area to provide additional protection to GB cod and Cape Cod yellowtail flounder. This additional area also provides some additional protection to areas of complex habitat outside the existing closed area.

Closed Area II: An additional area is closed at the northwestern side of the area. This additional closure will provide additional mortality reductions for GB cod, and provides additional protection to an area of complex habitat. The southern boundary of the area is moved north ten miles in order to provide access to yellowtail flounder.

Western Gulf of Maine Closed Area: The eastern boundary is moved west to 70 W at the northern part of the area. This provides additional access to haddock, witch flounder and pollock while continuing to provide protection to the areas of complex habitat within the closure.

Additional year round closed areas are implemented in the Gulf of Maine. Thirty minute square blocks 124, 132, 133, 128, and 129 are closed year round *(see section 4.2.3.1.2 for an alternative to the year round closures of blocks 124, 132, and 133 that is being examined*).

Blocks 124, 132, and 133 are closed primarily to provide mortality reductions for GOM cod. In addition, block 124 provides a mortality reduction for CC/GOM yellowtail flounder. The closure of blocks 124 and 132 also provide additional protection to areas of complex habitat just outside the current Western Gulf of Maine closed area (though the entire blocks are not identified as complex habitat*). (See section 4.2.3.1.2 for an alternative to the year round closure of these three blocks).*

Blocks 128 and 129 provide additional protection for GOM cod.

Prohibited Gears

There are two options for determining which gear types are prohibited from these additional year-round closed areas:

<u>Option 1</u>: Gear excluded from the additional year round closed areas established in Amendment 13 will be the same gear that is not allowed in the current year-round closed areas adjacent to these additional areas.

<u>Option 2</u>: Gear excluded from the additional year round closed areas established in Amendment 13 will be the same gear that is excluded from seasonal or rolling closures adjacent to these additional areas. This option will allow, for example, tuna purse seines to fish in block 98 even if it is closed to protect groundfish mortality.

4.2.3.1.3.2 Seasonal Closed Areas

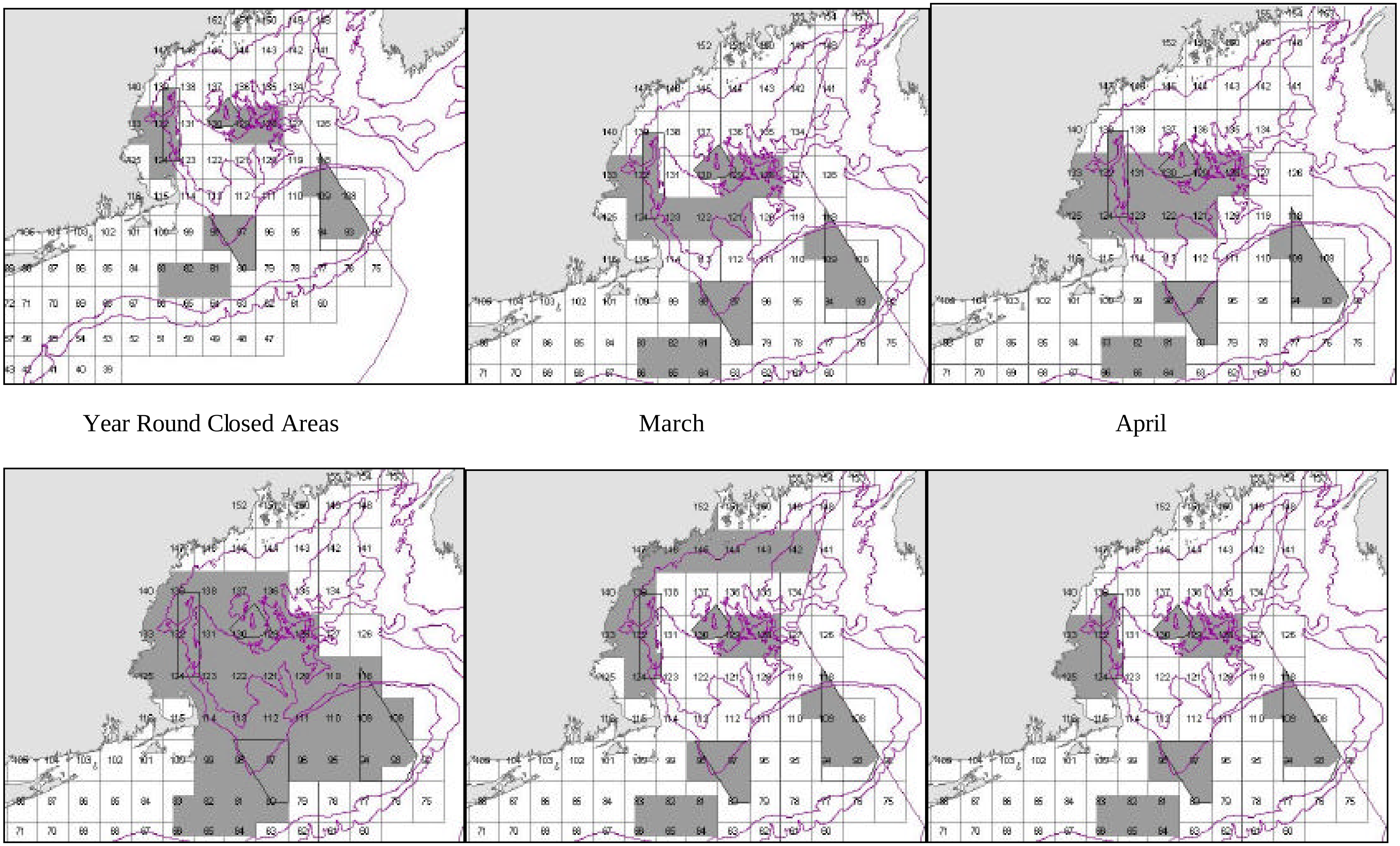
The seasonal closures adopted by the court in the case of *Conservation Law Foundation et al v. Evans et al.* are continued, with some modifications on Georges Bank in May.

Gulf of Maine rolling closures:

March:	121, 122, 123
April:	121-125; 129 – 133;
May:	124,125; 129-133; 136-140
June:	132, 133; 139-140; 141-147; 152
October:	124, 125
November:	124, 125

Georges Bank rolling closure:

May: 80-82; 94-99; 109-114; 118-123



Year Round Closed Areas　　March　　April

May　　June　　October - November

Figure 36 – Proposed area closures (see text for possible alternative to year round closure of blocks 124, 132, and 133 being examined by the PDT)

4.2.3.1.4 Possession Limits

GOM Cod: January – June: 800 lbs/day and 4,000 lbs./trip
July – December: 600 lbs./day and 3,000 lbs./trip

GB cod: 1,500 lbs./day and 15,000 lbs./trip

Haddock: 50,000 lbs./trip; the Regional Administrator can adjust the trip limit, or impose a daily limit, if necessary to prevent exceeding the TAC

SNE yellowtail flounder: There are two options:
March 1 – May 31: 250 pound possession limit;
June 1 – February 28: 750 lbs. possession limit

MA yellowtail flounder: TBD
Note: The SNE and MA yellowtail flounder stocks were assessed during SAW 36. and were combined as a single stock.

4.2.3.1.5 Gear Restrictions

The following minimum mesh restrictions apply:

Trawl net codends:

GOM/GB RMA: 6.5 inch diamond or square
SNE RMA: 6.5 inch square or 7 inch diamond mesh
MA RMA: 6.5 inch diamond or square

Gillnets:

GOM/GB/SNE RMA: 6.5 inch
MA RMA: 5.5 inch mesh
Gillnet vessels are limited to the number of nets implemented through Amendment 7 and subsequent framework actions (i.e. net limits in effect during fishing year 2001)

Longline vessels (under any permit category):
4,500 hooks
12/0 circle hooks

4.2.3.1.6 Minimum Fish Sizes

Maintain minimum fish sizes adopted by settlement agreement among certain parties:

Cod: 22 inches (roughly L10 for 6.5 inch square trawl mesh)

4.2.3.1.7 Large Mesh Program

Vessels may choose to participate in a large mesh program by using mesh that is two inches larger than the mesh specified for the area fished. Vessels participating in the program are limited to a cod possession limit that is one-half the possession/trip limit in effect in the area fished. Vessels participating in the program will be receive a 25 percent increase in their allocated DAS.

4.2.3.2 Other Measures

All requirements to take blocks of time out of the fishery are removed.

4.2.3.3 VMS Requirements

There are three options for VMS coverage:

4.2.3.3.1 Option 1

VMS is required for all limited access groundfish vessels.

4.2.3.3.2 Option 2

VMS is required for vessels allocated more than 10 groundfish DAS.

4.2.3.3.3 Option 3

VMS is required for vessels allocated more than 20 groundfish DAS.

Under all three options, the Thrane & Thrane 3026M ($1550 per unit), Thrane & Thrane PC ($1350 per unit) or a similar device is required. Additionally, the current VMS demarcation line will be moved in to the coastline.

4.2.4 Hard TAC Alternative

In the process of developing the hard TAC alternative (see section 4.1.5.5), several options for managing the TAC were considered and rejected.

4.2.4.1 Directed/Incidental TACs

This option would have established a TAC for each stock. The TAC would have been further broken down into separate TACs for directed and incidental fisheries. This option was rejected because it proved difficult to define a directed and incidental fishery in a manner acceptable to a majority of Council members. In addition, this approach would have resulted in a requirement to monitor and administer numerous TACs, and detailed analysis demonstrates that this would not have been feasible.

4.2.5 DAS Trimester Quotas

This alternative uses the same management measures as the 50 percent DAS reduction alternative with an exception. This alternative does not assume that any measures are taken to reduce or control the availability of unused DAS. Instead, the number of DAS that can be used in the fishery is calculated and then apportioned through the fishing year. As a result, measures to reduce capacity are not necessary to achieve mortality objectives. DAS that can be used in the fishery would have been calculated on an annual basis and apportioned into three trimesters based on historic patterns of DAS use. NMFS would have monitored DAS use in a trimester and prohibit fishing under a multispecies DAS once the DAS allowance for a trimester is attained.

This alternative does not address capacity issues in the fishery, one of the objectives of the amendment. In addition, the limitation on DAS used in each trimester would clearly create an incentive for a "race to fish", would encourage unsafe fishing practices as vessels operators push to use their DAS before the fishery closes, and would likely result in interruptions in supply as most fish would be landed at the beginning of a trimester. For these reasons, the Council determined that this was not a reasonable alternative that should be analyzed.

4.2.6 Open Access Handgear Industry Proposal

This alternative would have converted the current Category H permit into three categories: two limited access (Category A and Category B) and one open access category (C). Fishing opportunities would vary depending on permit qualification. Vessels would have been allowed to possess both a limited access and open access permit at the same time, changing the permit structure of the fishery. Under certain permit categories, vessels would have been allowed to fish in seasonal/rolling closures.

This proposal is not consistent with the objectives of the amendment or the groundfish FMP because it proposed to allow possession of both a limited access and open access permit at the same time, and excluded open access permits from the rolling closures. For these reasons, the Council determined that this alternative was not reasonable and did not warrant further analysis.

4.2.7 Measures to Minimize Impacts of Fishing on Essential Fish Habitat

4.2.7.1 Non-Selected Alternatives

4.2.7.1.1 No Action (No additional habitat-related management measures)

This alternative retains the groundfish year-round closed areas that were in effect during fishing year 2001 prior to the settlement agreement *(CLF et al. v. Evans et al.)*. Under this alternative, no new management measures will be implemented as part of Amendment 13 that are specifically intended to protect essential fish habitat or reduce impacts associated with fishing.

The existing management measures, including year-round closed areas, trip/landing limits, gear restrictions and effort limitations, are acknowledged to have provided habitat benefits. It is important to note, however, that the year-round closed areas were intentionally not closed for habitat and/or EFH protection purposes, and therefore do not constitute habitat closures.

This alternative was not selected because it does not address M-S Act requirements to minimize, to the extent practicable, the adverse effects of fishing on EFH. The Council believes that there are additional measures that are practicable that will minimize any adverse effects.

4.2.7.1.2 Alternative 3 - Closed Areas Designed to Protect Hard-Bottom Habitats

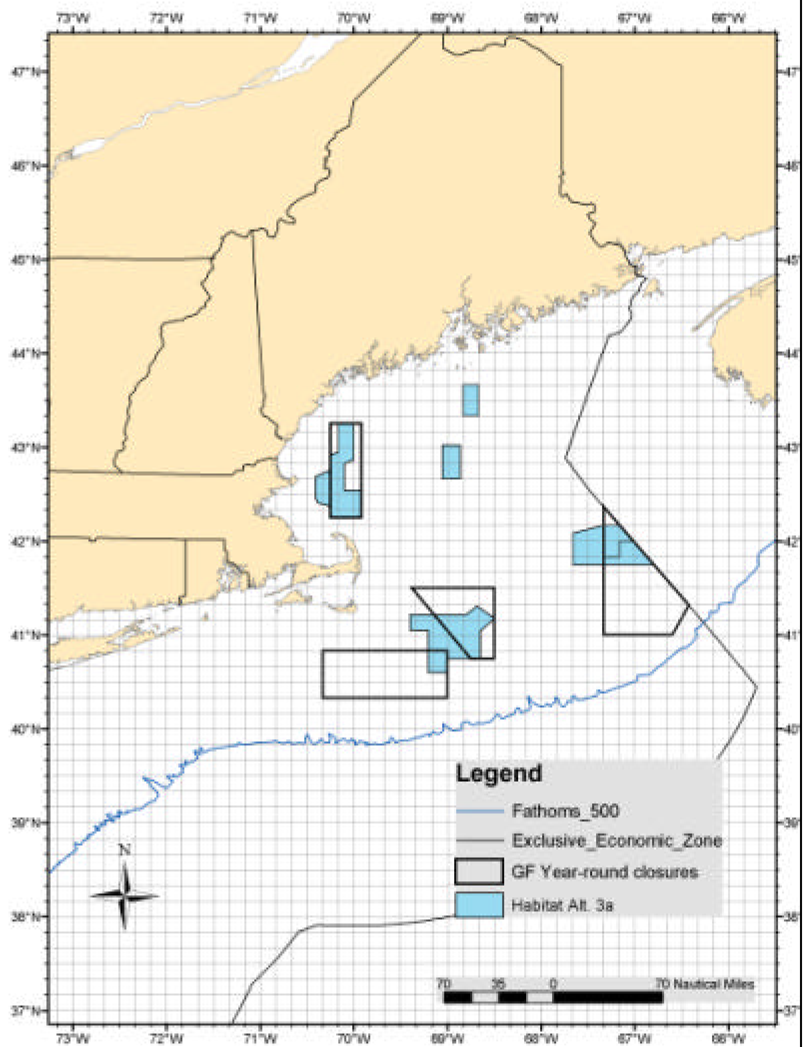
In this alternative, areas both inside and outside of the existing groundfish closures are identified for habitat closure to better protect complex hard-bottom and other sensitive habitats. The Council approved this alternative with two versions of the Western Gulf of Maine closed area. These have been incorporated as two options:

- Alternative 3A, which has a larger extension of the WGOM to the west.
- Alternative 3B, which has a smaller extension of the WGOM closure to the west.

Figure 27 and Figure 28 provide a graphical representation of the proposed habitat closure options and coordinates for the boundaries of those areas.

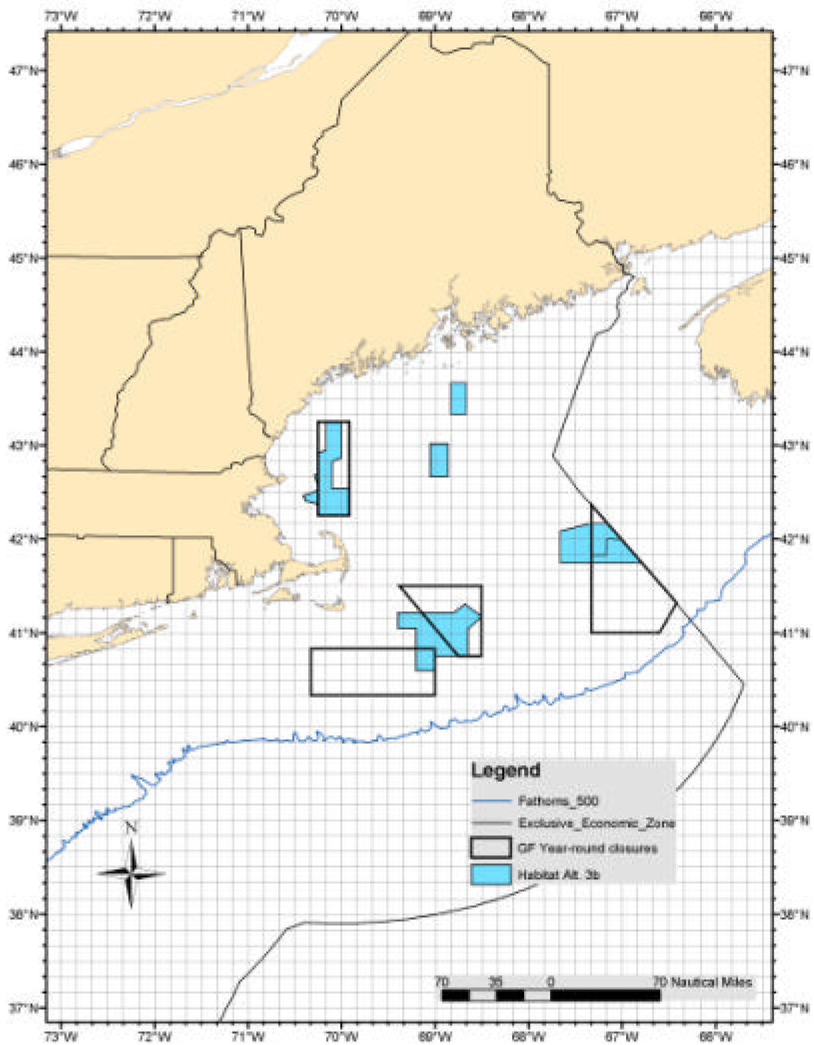
4.2.7.1.3 Alternative 4 –Closed Areas Designed to Protect Hard-Bottom Habitats

Habitat closure areas in this alternative are derived from areas proposed in alternative 3 that overlap modified groundfish closed areas originally proposed as a stock rebuilding alternative for Amendment 13 of the NEFMC Multispecies Fishery Management Plan. While that alternative has been considered and rejected for stock rebuilding purposes, the Council did not expressly reject the closures proposed in Alternative 4 for habitat management purposes. Because these modifications were rejected for groundfish management purposes, adoption of habitat closed area alternative 4 would not affect the boundaries of the existing groundfish closures. The closures proposed in this alternative are intended to better protect complex hard-bottom and other sensitive habitats from any adverse impacts associated with fishing. They are shown in Figure 18.



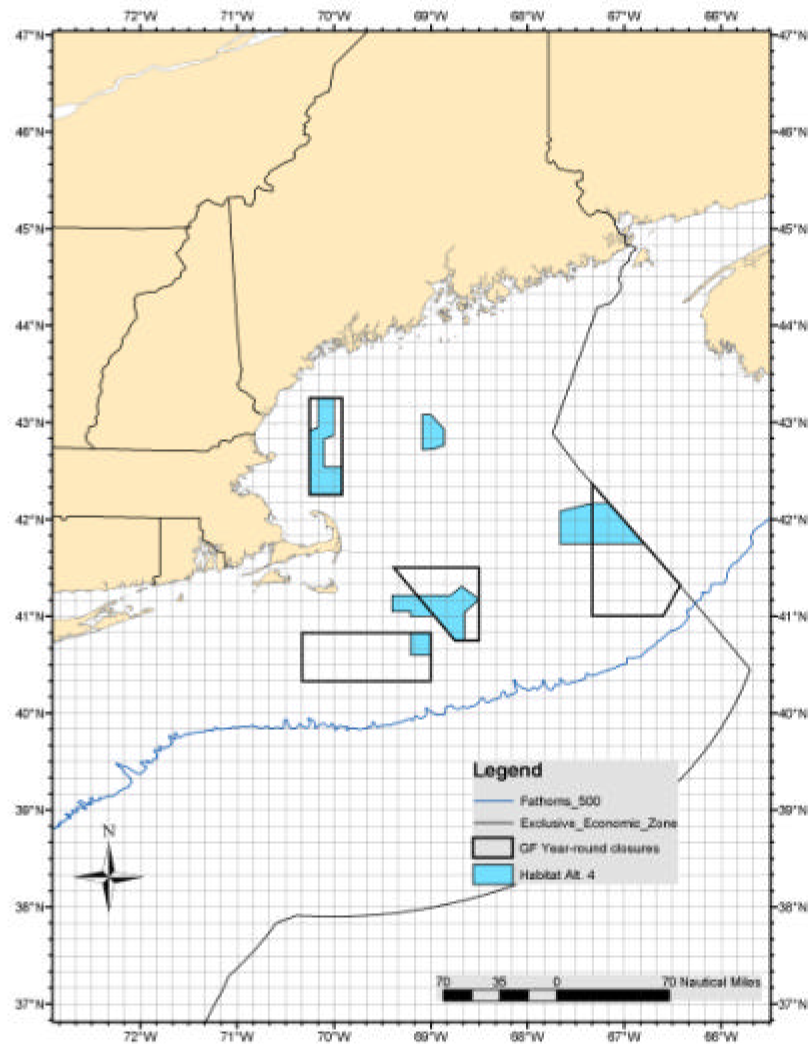
	Point #	LONGITUDE			LATITUDE		
		deg	min	sec	deg	min	sec
Habitat Area I	1	69	24	0	41	13	0
	2	68	48	0	41	13	0
	3	68	41	0	41	18	30
	4	68	30	0	41	10	30
	5	68	39	0	41	2	30
	6	68	39	0	40	45	0
	7	69	0	0	40	36	0
	8	69	0	0	40	36	0
	9	69	12	30	40	36	0
	10	69	12	30	41	3	0
	11	69	24	0	41	3	0
Habitat Area II	1	67	40	0	42	5	0
	2	67	20	0	42	10	0
	3	67	9	35	42	10	0
	4	66	47	48	41	45	0
	5	67	40	0	41	45	0
Cashes Habitat	1	69	3	22	43	1	14
	2	68	51	56	43	1	14
	3	68	51	56	42	39	46
	4	69	3	22	42	39	46
Jeffrey's Habitat	1	68	50	0	43	40	0
	2	68	40	0	43	40	0
	3	68	40	0	43	20	0
	4	68	50	0	43	20	0
WGOM Alt. 1	1	70	10	0	43	15	0
	2	70	0	0	43	15	0
	3	70	0	0	42	52	0
	4	70	6	4	42	49	33
	5	70	6	4	42	32	30
	6	69	55	0	42	32	30
	7	69	55	0	42	15	0
	8	70	15	0	42	15	0
	9	70	15	0	42	20	27
	10	70	17	0	42	23	0
	11	70	23	0	42	24	18
	12	70	24	42	42	27	44
	13	70	24	42	42	41	18
	14	70	15	0	42	45	14
	15	70	15	0	42	55	0
	16	70	10	0	42	57	0

Figure 37 - Map and Coordinates for Habitat Alternative 3a (current groundfish closed areas included for reference)



	Point #	LONGITUDE			LATITUDE		
		deg	min	sec	deg	min	sec
Habitat Area I	1	69	24	0	41	13	0
	2	68	48	0	41	13	0
	3	68	41	0	41	18	30
	4	68	30	0	41	10	30
	5	68	39	0	41	2	30
	6	68	39	0	40	45	0
	7	69	0	0	40	36	0
	8	69	0	0	40	36	0
	9	69	12	30	40	36	0
	10	69	12	30	41	3	0
	11	69	24	0	41	3	0
Habitat Area II	1	67	40	0	42	5	0
	2	67	20	0	42	10	0
	3	67	9	35	42	10	0
	4	66	47	48	41	45	0
	5	67	40	0	41	45	0
Cashes Habitat	1	69	3	22	43	1	14
	2	68	51	56	43	1	14
	3	68	51	56	42	39	46
	4	69	3	22	42	39	46
Jeffrey's Habitat	1	68	50	0	43	40	0
	2	68	40	0	43	40	0
	3	68	40	0	43	20	0
	4	68	50	0	43	20	0
WGOM Alt. 2	1	70	0	0	43	15	0
	2	70	0	0	42	52	0
	3	70	6	4	42	49	33
	4	70	6	4	42	32	30
	5	69	55	0	42	32	30
	6	69	55	0	42	15	0
	7	70	15	0	42	15	0
	8	70	15	0	42	20	27
	9	70	17	0	42	23	0
	10	70	23	0	42	24	18
	11	70	24	42	42	27	44
	12	70	15	0	42	31	27
	13	70	15	0	42	33	50
	14	70	17	35	42	41	0
	15	70	15	0	42	41	35
	16	70	15	0	42	55	0
	17	70	10	0	42	57	0
	18	70	10	0	43	15	0

Figure 38 - Map and Coordinates for Habitat Alternative 3b (current groundfish closed areas included for reference)



	Point	LONGITUDE		LATITUDE	
		deg	min	deg	min
GOM	1	70	9	43	15
	2	70	0	43	15
	3	70	0	42	51
	4	70	6	42	49
	5	70	6	42	32
	6	69	54	42	32
	7	69	54	42	15
	8	70	15	42	15
	9	70	15	42	20
	10	70	15	42	54
	11	70	10	42	57
CAI	1	69	24	41	13
	2	68	47	41	13
	3	68	40	41	18
	4	68	30	41	10
	5	68	39	41	2
	6	68	39	40	45
	7	68	45	40	45
	8	68	57	41	0
	9	69	12	41	0
	10	69	12	41	2
	11	69	24	41	2
CAII	1	67	40	42	4
	2	67	20	42	10
	3	67	9	42	10
	4	66	47	41	45
	5	67	40	41	45
Nantucket	1	69	0	40	50
	2	69	0	40	36
	3	69	12	40	36
	4	69	12	40	50
Cashes	1	69	5.8	43	4.4
	2	68	59.5	43	4.4
	3	68	51.5	42	55.6
	4	68	51.5	42	45.6
	5	68	58.3	42	43.3
	6	69	5.8	42	43.1

Figure 39 - Map and Coordinates for Habitat Alternative 4 (current groundfish closed areas included for reference)

4.2.7.1.4 Alternative 5 - Closed areas designed to protect EFH and balance fishery productivity

This alternative establishes closed areas that balance the protection of EFH and fishery productivity. Closed areas were determined on the basis of a model that assigned a value for EFH importance and fishery productivity (in the scallop, groundfish, and monkfish fisheries) in each ten minute square from the southern border of Canada to the northern border of South Carolina. Closed areas were then designated based on four decision criteria for each ten minute square: 1) reliance of the stocks on bottom habitat (life history considerations), 2) stock status, 3) relative value to the fisheries and 4) vulnerability of bottom habitat. The model identified one closed area, based on closure areas of more than eight (or nine, depending on the closure shape) contiguous ten minute squares, for each of the management areas (e.g. Gulf of Maine, Georges Bank, Southern New England and Mid-Atlantic). The following four options were developed:

Alternative 5A: EFH/Productivity tradeoffs using the original working group species EFH weights with equal emphasis given to scallop productivity and the combined weighted productivity of 37 other managed species.

Alternative 5B: Total EFH value only, using revised species EFH weights (omitting relative importance to the fishery as a factor), with no productivity tradeoff.

Alternative 5C. EFH/Productivity tradeoffs using the revised species EFH weights with equal emphasis given to scallop productivity and the combined weighted productivity of the other 37 managed species.

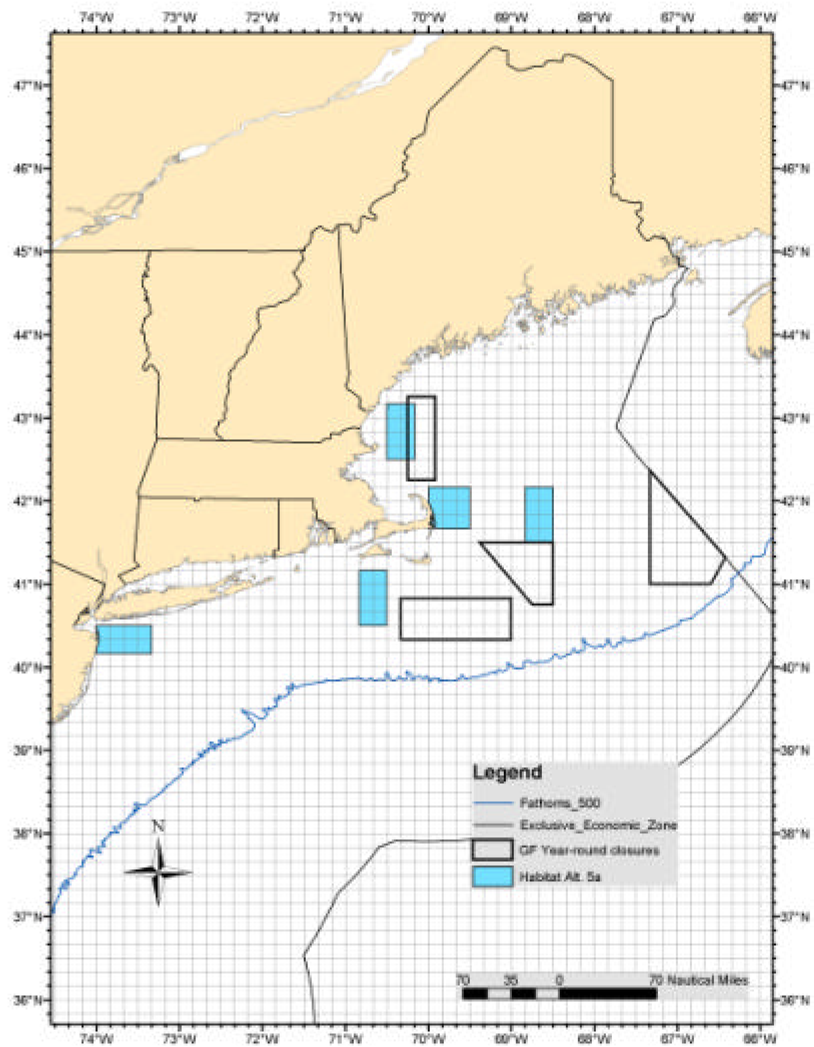
Alternative 5D. EFH/Productivity tradeoffs using the revised species EFH weights and productivity for each of the 37 managed species, considered individually.

Figure 30 through **Figure 33** display maps and coordinates for these closures. See Appendix V for a detailed description of the model used to determine these closure areas.

4.2.7.1.5 Alternative 6 – Habitat Closures consistent with the Framework Adjustment 13 Scallop Closed Areas Access Program

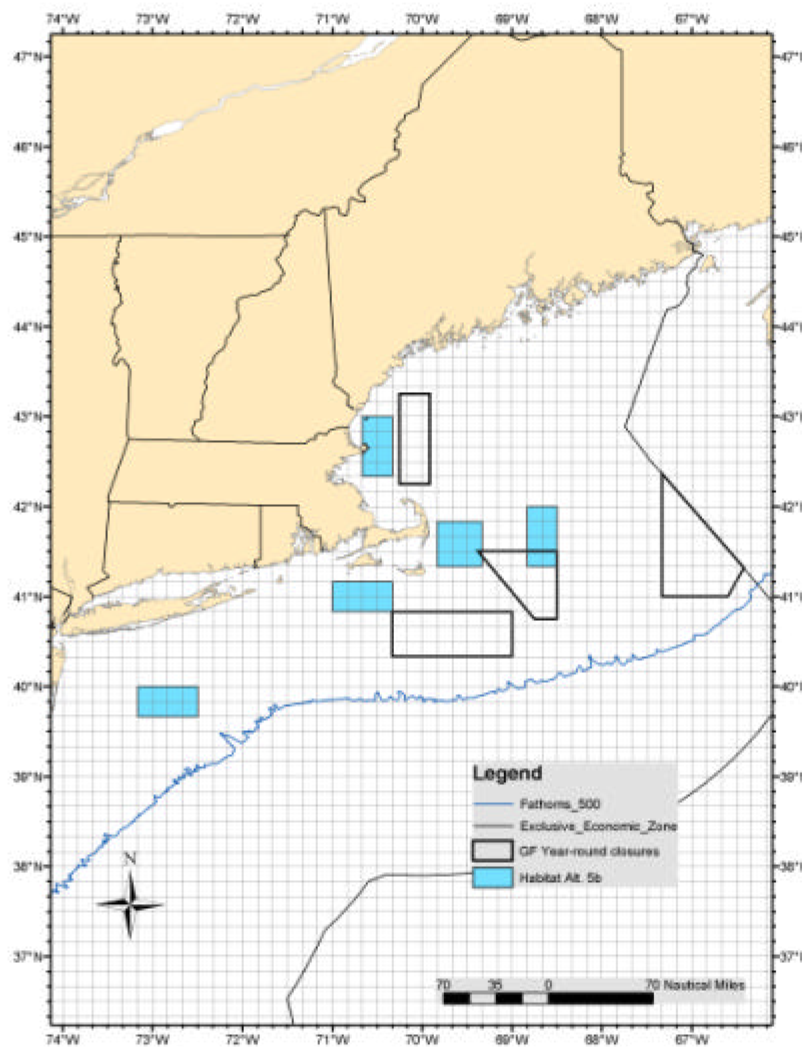
In this alternative the year-round groundfish closed areas (WGOM, , CA I, CA II and NLCA) that were in place during the 2001 fishing year are considered habitat closures with the exception of those areas opened under the Scallop FW 13 Closed Area Access Program.

See Figure 34 for a map of the closures.



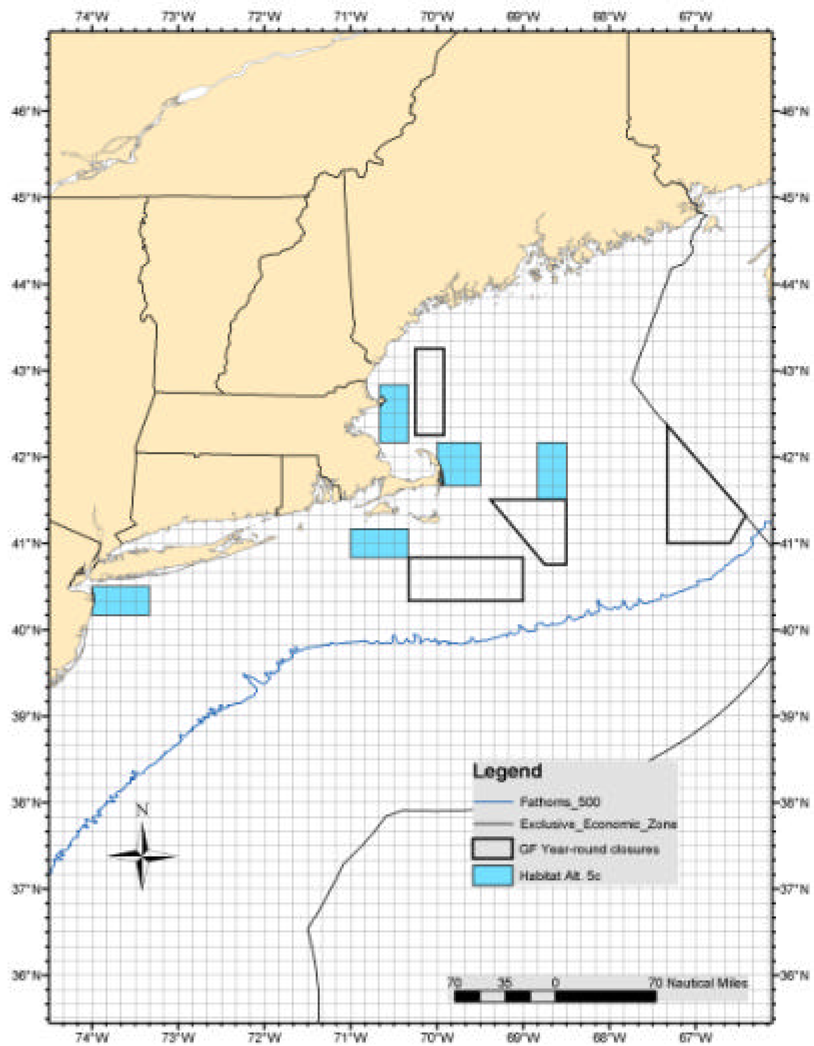
		LATITUDE (°N)		LONGITUDE (°W)	
		deg	min	deg	min
GB					
	NW	42	10	68	50
	NE	42	10	68	30
	SE	41	30	68	30
	SW	41	30	68	50
GOM					
	NW	43	10	70	30
	NE	43	10	70	10
	SE	42	30	70	10
	SW	42	30	70	30
GSC					
	NW	42	10	70	0
	NE	42	10	69	30
	SE	41	40	69	30
	SW	41	40	70	0
MA					
	NW	40	30	74	0
	NE	40	30	73	20
	SE	40	10	73	20
	SW	40	10	74	0
SNE					
	NW	41	10	70	50
	NE	41	10	70	30
	SE	40	30	70	30
	SW	40	30	70	50

Figure 40 - Map and Coordinates for Habitat Alternative 5a (current groundfish closed areas included for reference)



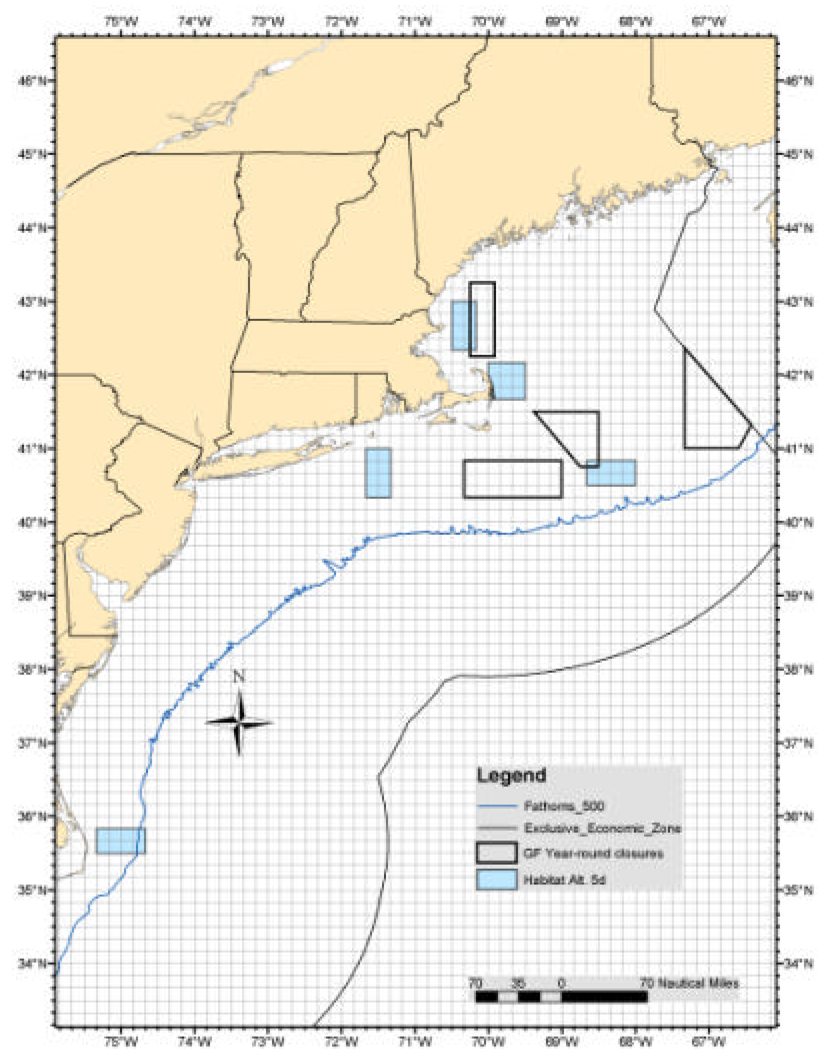
		LATITUDE (°N)		LONGITUDE (°W)	
		deg	min	deg	min
GB					
	NW	42	0	68	50
	NE	42	0	68	30
	SE	41	20	68	30
	SW	41	20	68	50
GOM					
	NW	43	0	70	40
	NE	43	0	70	20
	SE	42	20	70	20
	SW	42	20	70	40
GSC					
	NW	41	50	69	50
	NE	41	50	69	20
	SE	41	20	69	20
	SW	41	20	69	50
MA					
	NW	40	0	73	10
	NE	40	0	72	30
	SE	39	40	72	30
	SW	39	40	73	10
SNE					
	NW	41	10	71	0
	NE	41	10	70	20
	SE	40	50	70	20
	SW	40	50	71	0

Figure 41 - Map and Coordinates for Habitat Alternative 5b (current groundfish closed areas included for reference)



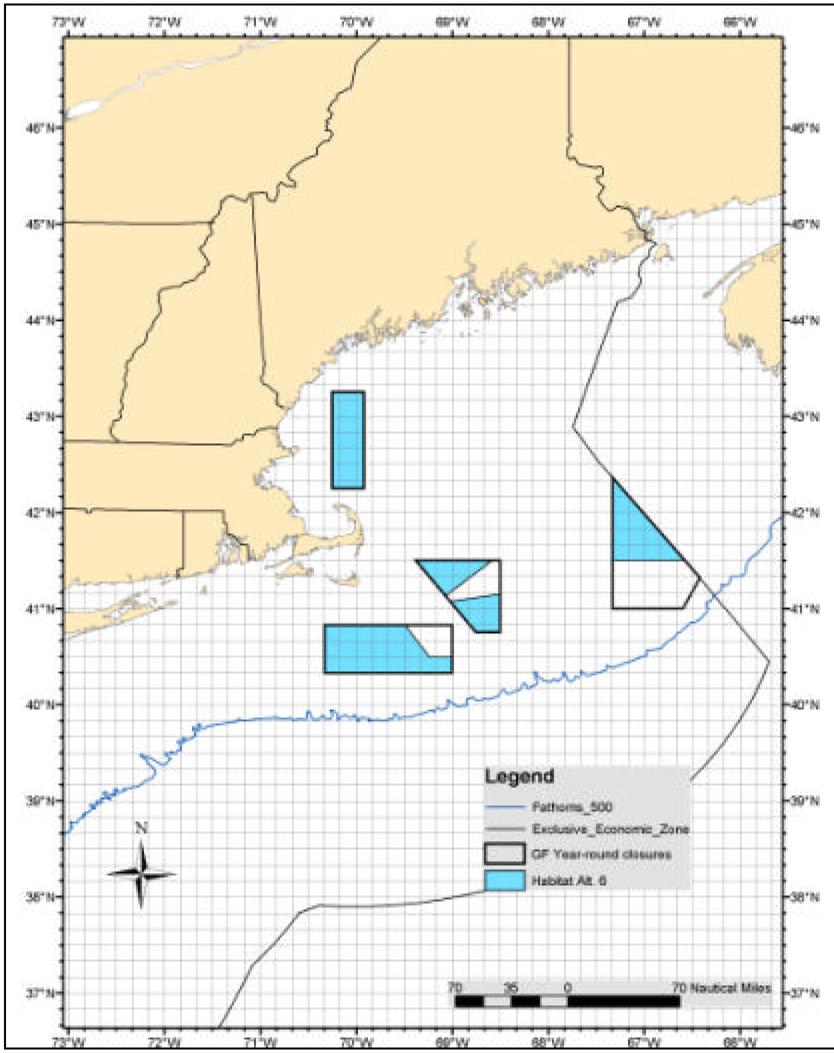
		LATITUDE (°N)		LONGITUDE (°W)	
		deg	min	deg	min
GB					
	NW	42	10	68	50
	NE	42	10	68	30
	SE	41	30	68	30
	SW	41	30	68	50
GOM					
	NW	42	50	70	40
	NE	42	50	70	20
	SE	42	10	70	20
	SW	42	10	70	40
GSC					
	NW	42	10	70	0
	NE	42	10	69	30
	SE	41	40	69	30
	SW	41	40	70	0
MA					
	NW	40	30	74	0
	NE	40	30	73	20
	SE	40	10	73	20
	SW	40	10	74	0
SNE					
	NW	41	10	71	0
	NE	41	10	70	20
	SE	40	50	70	20
	SW	40	50	71	0

Figure 42 - Map and Coordinates for Habitat Alternative 5c (current groundfish closed areas included for reference)



		LATITUDE (°N) deg	LATITUDE (°N) min	LONGITUDE (°W) deg	LONGITUDE (°W) min
GB					
	NW	40	50	68	40
	NE	40	50	68	0
	SE	40	30	68	0
	SW	40	30	69	40
GOM					
	NW	43	0	70	30
	NE	43	0	70	10
	SE	42	20	70	10
	SW	42	20	70	30
GSC					
	NW	42	10	70	0
	NE	42	10	69	30
	SE	41	40	69	30
	SW	41	40	70	0
MA					
	NW	35	50	75	20
	NE	35	50	74	40
	SE	35	30	74	40
	SW	35	30	75	20
SNE					
	NW	41	0	71	40
	NE	41	0	71	20
	SE	40	20	71	20
	SW	40	20	71	40

Figure 43 - Map and Coordinates for Habitat Alternative 5d (current groundfish closed areas included for reference)



	Point #	LONGITUDE deg	LONGITUDE min	LATITUDE deg	LATITUDE min
CAI	1	69	1.2	41	4.5
	2	68	30	41	9
	3	68	30	40	45
	4	68	45	40	45
	5	69	23	41	30
	6	68	35	41	30
	7	69	4.3	41	8
CAII	1	67	20	42	22
	2	66	34.8	41	30
	3	67	20	41	30
Nantucket	1	69	0	40	20
	2	69	0	40	30
	3	69	14.5	40	30
	4	69	29.5	40	50
	5	70	20	40	20
	6	72	20	40	50
WGOM	1	69	55	42	15
	2	69	55	43	15
	3	70	15	43	15
	4	70	15	42	15

Figure 44 - Map and Coordinates for Habitat Alternative 6 (current groundfish closed areas included for reference)

4.2.7.1.6 Alternative 8 - Restrictions on the use of rockhopper and/or roller gear

This alternative will restrict the use of both rockhopper and roller trawl gear to protect areas of high-relief bottom where these gears are frequently employed. It is recognized that rockhopper and roller trawl gear function differently, and that they may interact differently with benthic habitats, but very little information is available with which to distinguish the effects of these gears on fishable bottom and/or EFH. Therefore, these two gears are treated equally for the purposes of this alternative.

Under this alternative, the restriction could extend throughout the Gulf of Maine (only), throughout the Gulf of Maine and Georges Bank, or throughout the entire range of the multispecies fishery and apply to anyone with a multispecies permit.

The following versions of this alternative are proposed. Listed from least restrictive to most restrictive:

8(a) - A prohibition on the use of any rockhopper and roller trawl gear with a diameter larger than the current maximum size (estimated to be between 31" and 36").

This alternative will freeze the maximum size of rockhopper and roller trawl gear at the maximum size currently in use. It is estimated that the maximum size of rockhopper and roller trawl gear currently being used in the New England region is from 31" to 36" in diameter. To more accurately pinpoint the current maximum size, the Council will contact fishermen and gear distributors in the New England region and assess the largest size rockhopper and roller gear that they currently use or stock and sell. Once the maximum allowable size is capped, the Council and NMFS is expected to research the specific effects of various sizes of rockhopper and roller trawl gear on a variety of important groundfish habitats. The Council will use this new information to determine whether the maximum allowable size should be further reduced, maintained at current levels, or eliminated (no size restriction). This research would also target the differences between rockhopper and roller gear, and whether differential size restrictions are a more appropriate management tool to minimize the effects of these gear types on EFH.

8(b) - A prohibition on the use of otter trawl groundgear with a diameter larger than 22"

This alternative prohibits the use of otter trawl groundgear with a diameter larger than 22 inches. Cookies or other types of groundgear configurations 22" or less in diameter, including rockhoppers and rollers, will be allowed. This alternative may be implemented through an immediate prohibition on all gear larger than 22" or through a step-wise reduction over time.

8(c) - A prohibition on the use of otter trawl groundgear with a diameter larger than 12", consistent with the existing maximum size limit in near shore portions of the Gulf of Maine.

This alternative prohibits the use of otter trawl groundgear with a diameter larger than 12". Cookies or other types of groundgear configurations, including rockhoppers and rollers, 12" in diameter or smaller will be allowed. This alternative may be implemented through an immediate prohibition on all gear larger than 12" or through a step-wise reduction over time. This alternative allows some configurations of small rockhopper and roller trawl gear to continue to be fished.

This alternative is an extension of a limit already in place in much of the western Gulf of Maine. Currently, the Council prohibits discs, rockhoppers and roller gear larger than 12" between 42° and 43° 30' North latitude from the shoreline out to either 70° or 69° 50' West longitude.

8(d) - A prohibition on the use of all rockhopper and roller trawl gear.
This would be a prohibition of all otter trawl configurations that employ ground gear with a diameter larger than 5" (the use of "cookies" with a diameter of 5" or less would be allowed).

This alternative prohibits the use of otter trawl groundgear with a diameter larger than 5". Cookies 5" in diameter or smaller will be allowed. This alternative may be implemented through an immediate prohibition on all gear larger than 5", or through a step-wise reduction over time. Five inches was identified as an option for the maximum size of cookies based on gear believed to be commonly stocked by gear distributors and used by fishermen in New England. Cookie size is reported to be somewhat variable and may range from 3" to 5" in diameter.

8(e) - A stepwise reduction in the maximum allowable size of otter trawl groundgear.
This could be considered a stand-alone alternative, or it could be incorporated into any of the reductions/prohibitions on rockhopper and roller gear size considered as alternatives above except for Alternative 8(a).

This alternative prohibits the use of any otter trawl groundgear with the following stipulations: From the start of the first new fishing year that begins after the implementation of Amendment 13, the maximum allowable diameter of groundgear will be reduced in stages over a period of six years from a maximum of 24" to a maximum of 5". For example, if the first fishing year after implementation of Amendment 13 is May 1, 2003, the maximum size of groundgear will be 24" from May 1, 2003 until April 30, 2005. It will then be reduced to 12" from May 1, 2005 until April 30, 2007 and reduced again to 8" from May 1, 2007 until April 30, 2009. Thereafter, beginning May 1, 2009, the maximum size of groundgear will be 5". The specific dates are examples of a reduction program that could be used. The program may be compressed over less time, stretched out over a longer timeframe, or the individual time period in which each size limit is in place could be varied. Also, the specific gear size increments could be different (e.g., from a maximum size of 30" to 24", then to 18", and then to 12").

4.2.7.1.7 Alternative 9 - VMS on all groundfish vessels

This alternative requires VMS on all groundfish vessels, a critical step in obtaining high-resolution data on the distribution of fishing effort. The specifications on how best to implement this alternative will be left to the Groundfish Committee and PDT.

4.2.7.1.8 Habitat Alternative 10, Option (a) – Compromise Habitat Closure Areas

This alternative was developed to incorporate areas that would benefit EFH, but not in the most productive fishing grounds currently available to fishermen. Both existing mortality closures and proposed habitat closures were modified to develop one alternative that closes sensitive habitat and balances the need to provide access to primary fishing grounds. In general, the alternative suggests changing the eastern boundary of the Western Gulf of Maine closure, and modifying the Nantucket Lightship closure. In addition, the access areas used in Framework 13 for Closed Area I were modified slightly. Lastly, the habitat closure proposals for Closed Area II, Jeffrey's, Bank, and Cashes Ledge were included in this alternative, with some modifications. *(Note that this action does NOT change the cod HAPC boundaries but rather identified modified areas of the HAPC as habitat closed areas. The boundaries of the cod HAPC, as implemented under Amendment 11 to the Northeast Multispecies FMP, remain unchanged.)*

Detailed justification of each closed area modification:

Closed Area I (CAI) - According to industry, Closed Area I is very beneficial for rebuilding haddock and may be the primary reason haddock are recovering today. However, CAI does not provide much benefit for cod. Much of CAI is sand, however, there are diverse sediment types scattered within the area. The southeastern portion of CAI contains much of the complex bottom in the closed area. The northern part of the Framework 13 scallop access area in the middle of CAI has important habitat for cod spawning. As such, the Framework 13 scallop access area was shifted southward so that the cod could gain protection in the north for spawning, and the scallop resource would be accessible in the closed area. Both option (a) and (b) include the modified version of the Closed Area I as a habitat closure.

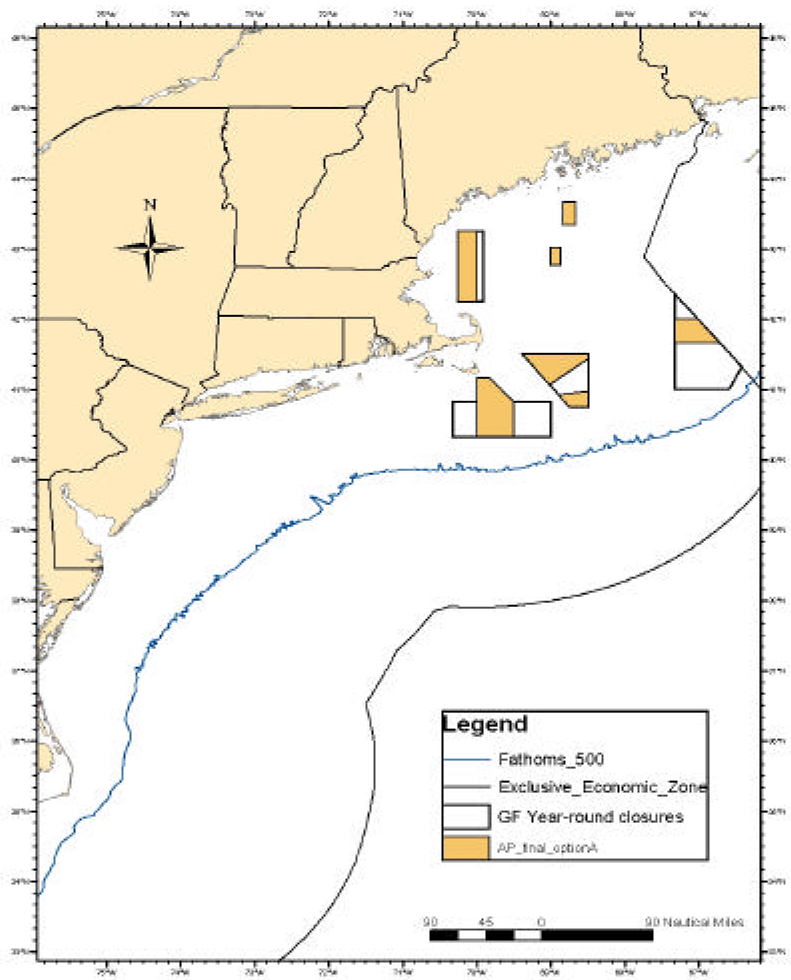
Closed Area II (CAII) - Survey data suggests that young of the year cod are in the HAPC in the summer near the rocky bottom that is along the Northern edge boundary. It was identified that there is a significant amount of sensitive habitat in the middle of the HAPC. For purposes of the habitat closed area boundaries, the existing boundary of the Cod HAPC was moved to the south to include more diverse sediment types that exist. The northern boundary enclosed area deeper than 50 fathoms that does not contain important cod or scallop habitat. This modification is more practical, because it still protects important habitat to the south, but allows access to the north; a true balance of conflicting demands on the area. The southern boundary was established at the southern end of the perceived groundfish spawning area. The new proposed closure is made up of mostly gravel with sand fingers. The lower portion was also identified as an important spawning ground for cod in the winter; in fact this area is still referred to as the “winter fishing ground” on nautical charts. The northern boundary of the Cod HAPC is too high, and if it were moved to the south, more benefit would be generated for cod and other groundfish species that live there. Note that this action does NOT change the cod HAPC boundaries but rather identified modified areas of the HAPC as habitat closed areas. The boundaries of the cod HAPC, as implemented under Amendment 11 to the Northeast Multispecies FMP, remain unchanged.

Western Gulf of Maine Closed Area (WGOM) - The new boundaries proposed in some of the habitat alternatives seem hard to enforce, and the industry would not gain much from the areas that would open. Modify the proposed habitat closure for the WGOM by the eastern boundary to come straight down the 70°W line instead of the irregular boundary proposed in habitat alternatives 3a, 3b, and 4. The main rational behind this modification is that the closed area would be easier to enforce and there are resources in the eastern portion of the closure that should be available to fishermen. Furthermore, the important areas for habitat are along the western boundary. If all the deep areas are closed to fishing then there is nowhere to go to avoid cod bycatch. It was also pointed out that this area is close to Gloucester, and this port depends on this area heavily. Both option (a) and (b) include the modified version of the WGOM as a habitat closure.

Nantucket Lightship Closed Area (NLCA) **-** Anecdotally, the substrate in the Nantucket Shoals is very complex. As such, this area has diverse sediment types and is important for the protection of small fish. An extension of the area north of the Nantucket Lightship would be closed primarily to protect the habitats on which small fish depend. A benthos map completed roughly in the 1960s showed that most of the concentrations of benthos in this area were contained in the central portion of the Nantucket Lightship area. Although this area is mostly sand, it contains many species. The modifications to include the central portion and an extension to the north contain a diversity of sediments and species. Both option (a) and (b) include the modified version of the NLCA as a habitat closure.

Cashes Ledge Closed Area - the closure should be modified to the 42°45W line. The southern boundary should be moved up, because the deeper area to the south does not contain kelp and should be assessable for fishing. Both option (a) and (b) include the modified version of the Cashes Ledge Closure as a habitat closure.

Jeffrey's Ledge Closed Area - Both option (a) and (b) include the version contained in Alternative 3 (a) and (b) of the Jeffries Ledge Closed Area as a habitat closure.



Habitat Alternative 10a				
	Longitude (Deg. Min)		Latitude (Deg. Min)	
Closed Area II	67	20	42	0
	67	0	42	0
	66	43	41	40
	67	20	41	40
WGOM	70	15	43	15
	70	0	43	15
	70	0	42	15
	70	15	42	15
Cashes	69	3.22	43	1.14
	68	51.56	43	1.14
	68	51.56	42	45
	69	3.22	42	45
Jeffreys	68	50	43	40
	68	40	43	40
	68	40	43	20
	68	50	43	20
Nantucket	70	0	41	10
	69	50	41	10
	69	30	40	50
	69	30	40	20
	70	0	40	20
Closed Area I (N)	69	22.8	41	30
	68	30	41	30
	68	30	41	26
	69	1	41	4
Closed Area I (S)	68	53	40	55
	68	30	40	58
	68	30	40	45
	68	45	40	45

Figure 45 – Habitat Alternative 10a

4.2.7.2 Considered But Rejected Alternatives from DSEIS

4.2.7.2.1 Prohibition on hydraulic clam dredging in GOM, GB and SNE east of the 72^0 W line (Alternative 11)

This gear has been shown to be disruptive of benthic habitats and communities. Since the locus of the clam fishery is in the Mid-Atlantic, it may be appropriate to prohibit this type of gear in areas not dependent on the clam fishery.

Although this gear type is not used in a fishery managed by the New England Council, its use may have adverse impacts on groundfish habitat. Research has demonstrated its effects on habitat, including significant disruption of benthic habitat and communities. Most of the clam fishery occurs off the Mid-Atlantic and not in the Gulf of Maine or Georges Bank, but the fishery and gear type are allowed in both areas. To ensure that groundfish habitat in the Gulf of Maine and on Georges Bank are not adversely affected by hydraulic dredges, this alternative would prohibit the use of this gear type throughout the Gulf of Maine, Georges Bank, east of 72° West longitude to approximately the 42^0 20' North latitude line.

Although there are some Atlantic surf clams that occur in the Nantucket Lightship Closed Area and in the central portion of eastern Georges Bank, the vast majority of this population occurs south of Hudson Canyon. Ocean quahogs are distributed throughout the Northeast region, occurring east of the 70^0 20' boundary on Georges Bank and in the Gulf of Maine. The hydraulic dredge fishery occurs west of this line, on the southern New England shelf and in the Mid-Atlantic. Ocean quahogs are harvested with "dry" dredges and some hydraulic dredges in eastern Maine. This alternative would not be expected to have significant effects on the ocean quahog and Atlantic surf clam hydraulic dredge fisheries.

Hydraulic clam dredging could have significant short-term impacts on the habitat of Georges Bank, Gulf of Maine and Southern New England. Long-term impacts associated with this gear are not known, but the most significant impacts may be on groundfish food webs. This could be considered a proactive approach to managing a gear sector.

There may not be any actual need to implement this type of alternative since PSP concerns prevent fishing for clams on much of Georges Bank anyway and the prevalence of hard bottom in the Gulf of Maine prevents the use of this gear there. May need more information on long-term impacts (such as the duration and extent of chronic effects) before implementing this type of measure.

4.2.7.2.2 - Prohibition on bottom-tending mobile fishing gear (Alternative 12)

This would include all forms of otter trawls, scallop dredges, and beam trawls (there may be other gears and this list should be reviewed to determine what gear types would be prohibited). This alternative would be a straight-forward prohibition on all types of bottom-tending mobile fishing gear. The only bottom-tending fishing gears allowed to be used would be the fixed gears (gillnets, hook and line, pots and traps, etc.). Mobile gears would be allowed if they are not bottom-tending (e.g., midwater trawls). It is possible for this alternative to be area-specific and only apply to the Gulf of Maine, thus avoiding the most significant impacts on the scallop fishery, which at this point only harvests scallops using mobile gear. This alternative would be expected to result in significant adverse impacts on the fishing industry, both in compliance costs and loss of revenue from fishing. For several fisheries, suitable alternative fishing gears do not currently exist (such as shrimp and sea scallops). This alternative may be unnecessary in the extreme, as some bottom-tending mobile fishing gears are not considered to have significant adverse effects on some habitat types.

4.2.7.2.3 Coordinated MPA system (Alternative 13)

The current system of areas that meet at least some of the criteria for marine protected areas (the existing groundfish closed areas, gear restricted areas, etc.) was not established in a coordinated manner. A marine protected area system would allow for a coordinated approach to the protection of important habitat throughout the region. Developing criteria and designation protocols for an MPA system is a complicated procedure and requires cooperation among many agencies and management authorities. Although the Council can establish no-take zones and implement other area-based fishing restrictions which may qualify as MPAs, these types of issues are being considered under many of the management alternatives listed above. The establishment of a coordinated system of true MPAs that address all types of activities and impacts to the marine environment is outside of the purview and jurisdiction of the Council. For example, the Council has no authority or jurisdiction over activities such as sand and gravel mining, oil and gas exploration, channel dredging and dredge disposal, ocean dumping, etc. and yet these are all activities that should be considered, addressed, and possibly restricted in the designation of region-wide MPAs. The Council could participate and cooperate with other federal and state agencies and management authorities and initiate a long-term process to develop such a system, but this is not possible within the context of Amendment 13.

4.2.7.2.4 HAPCs have minimum set of restrictions (Alternative 14)

The process and rationale used to designate each individual HAPC will help identify management issues related to that HAPC. Appropriate management action, if any, is only appropriately considered on a case-by-case basis and tailored specifically to the circumstances of the HAPC. For example, the juvenile cod HAPC on Georges Bank is contained within a groundfish closed area. Trawling restrictions may be appropriate in this area, but they are unnecessary as the regulations for the groundfish closed area already prohibit all types of fishing gear capable of catching groundfish. Also, the Council designated eleven rivers in Maine as an HAPC for Atlantic salmon. Trawling restrictions are not appropriate or necessary in this HAPC, as the intent of the HAPC was to protect these river systems from adverse impacts associated with non-fishing related activities such as pollution and development. Along with the designation of each HAPC, the Council will identify the particular threats to the habitat of the area and propose and consider management actions to minimize those threats. In some cases, action by the Council may be warranted to reduce adverse effects caused by fishing, but in other cases, the threats may be non-fishing related. In these cases, the Council would develop conservation recommendations for the responsible agencies and encourage them the implement reasonable measures. Thus, it would be inappropriate to presuppose the best management measures for any HAPCs in a general sense.

4.2.7.2.5 Gear restrictions in juvenile cod habitat on Georges Bank (Alternative 15)

The Council will consider retaining the existing HAPC for juvenile cod on Georges Bank as well as an additional HAPC intended to protect juvenile cod habitat. The Council will also consider redesigning the existing groundfish closed areas to better protect habitat, and this will include some juvenile cod habitat on Georges Bank. Depending on the management approach selected by the Council and the specific management alternatives considered, there may be additional gear restrictions in juvenile cod habitat on Georges Bank resulting from Amendment 13. The Council will consider these actions in the context of the management objectives for the Amendment and will adopt whatever measures are necessary to achieve those objectives.

4.2.7.2.6 Seeding of epifauna (Alternative 16)

The growth of dense epifauna and related communities can be increased and enhanced by protecting areas where these organisms grow. Seeding of these communities may not be practicable at this time, and in most cases is probably unnecessary as there is no evidence that the abundance of planktonic invertebrate larvae is too low to support dense epifaunal growth. Suitable space with the proper physical and oceanographic conditions free from anthropogenic disturbance is most likely the limiting factor.

4.2.7.2.7 Create shelter and harvest predators (Alternative 17)

Additional shelter may not benefit all species and artificial reefs have not been demonstrated conclusively to add to production but may only serve to aggregate fish. The objective of this comment could be achieved by protecting known areas currently containing shelter. In cases where known shelter has been destroyed, this approach may have utility. Harvesting predators could have unintended adverse effects that could ripple through the food web and actually serve the opposite effect that they were intended. For example, suppose that the adults of resource species A are preyed upon by adults of predator species B, but that the juveniles of resource species A feed upon the larvae of predator species B. Removing adults of B would result in fewer B larvae, reducing the available food for species A, limiting survival and recruitment.

4.2.7.2.8 Precautionary approach (Alternative 18)

The precautionary approach is an approach to decision-making, not a specific management alternative that can be implemented through regulation.

4.2.7.2.9 Prohibit the "flophopper" gear (Alternative 19)

This alternative was a recommendation from scoping. Need to better understand what the "flophopper" gear is. The scoping comment letter suggesting this measure did not describe this gear type.

4.2.7.2.10 Keep groundfish closed areas closed for 10 years (Alternative 20)

The current groundfish closed areas, except for WGOM, are indefinite in duration. Amendment 13 will examine all current groundfish closed areas and explore their effectiveness and whether they should be continued. The actual duration of the closed areas will depend on many factors, including the recovery of groundfish stocks, their fisheries, and changing conditions. It is impossible at this time to say whether the groundfish closed areas will be necessary for ten more years, or even whether ten years will be sufficient to meet the Council's management objectives.

4.2.7.2.11 Remove tuna purse seiners from the list in Alternative 7 (Alternative 21)

This gear type was removed based on the preliminary data that NMFS provided on the experimental tuna purse seine fishery, which showed little or no impact on the bottom habitat.

4.2.7.2.12 Remove 8" maximum size from consideration in Alternative 8 (Alternative 22)

With this alternative, the Council would consider prohibiting the use of rockhopper and roller trawl gear with a groundgear diameter larger than 8". Cookies or other types of groundgear configurations, including small rockhoppers and rollers, 8" in diameter or smaller would be allowed. The implementation of this alternative could be via an immediate prohibition on all gear larger than 8", or could be done through a step-wise reduction over several years. This alternative uses 8" as the maximum allowable size rather than 5", which could allow for some different configurations of groundgear beyond simple cookies.

Setting limits on the maximum allowable size for rockhopper and roller gear could protect rough bottom habitats from any adverse impacts associated with these gear types by limiting the areas where mobile bottom gear can access. Long-term this could be more economically efficient for the groundfish fishery. As the maximum allowable diameter of the gear decreases, more and more rough bottom habitat would be protected from impacts associated with mobile bottom gear. This alternative would offer slightly more flexibility to the fishing industry than the 5" option.

There will be short-term costs to the industry from the loss of gear and having to buy new gear to comply with the measures. There may also be short-term production losses (less fish and less revenue) to the industry, although these losses will be mitigated as stocks recover. The smaller the maximum allowable size for this gear, less area and opportunities will remain for the fishing industry. Also, the remaining areas accessible for fishing may be fished harder as more fishermen move into these areas and this could reduce the availability of suitable habitat in open areas. There may be more competition between fishermen for accessible bottom, with the potential for increases in gear conflicts. This alternative would protect less area than the 5" option. For these reasons, this alternative was considered but rejected.

4.2.7.2.13 Area-based management program (Alternative 23)

Management areas could be differentiated based on habitat type and fish survey and landings distributions. Management (the extent and levels of fishing effort allowed, gear types allowed, seasonal restrictions, etc.) would be area-specific and based on the most appropriate levels given the characteristics of each area. This alternative may be most similar to the area-based management strategy being developed by the Groundfish Committee, but would be focused on habitat protection. The gear-specific areas aspect of this alternative would be based on the known distribution of sediments and other physical characteristics that result in the susceptibility to impacts resulting from specific fishing gear types.

This alternative proposes using sediment types, fish distributions, and landings data to establish distinct management areas for the protection of habitat. As an example, areas with sandy sediments and relatively high levels of flatfish could be allocated for flatfish fishing and the use of bottom-tending mobile gear. Areas of complex rock and boulder habitat with relatively high levels of cod could be allocated for cod fishing and gillnets and hook and line gear. Fishing effort data would be incorporated, along with fish distribution data, to identify different fishing areas. Other measures, such as differential DAS accounting based on area, could be applied as well. Based on available information, much of the region could initially remain unassigned, in which case all fishing activities and gear types would be allowed. As more information becomes available, additional areas could be defined and allocated.

The gear-specific area alternative would establish specific gear areas, based on sediment distribution and other characteristics such as depth, and where only the assigned gear types could be used. For example, a sandy area might be separated from a hard-bottom area and assigned to mobile gear. The hard-bottom area might be assigned to fixed fishing gears. It is possible, with this approach, to have mixed gear areas as well but the primary objective would be to assign different gear types to different areas. Under gear-specific area option, areas would not be differentiated by fishery and management (other than allowable gear types) would not be indicated. This would have both habitat benefits as well as minimize the potential for conflicts.

This alternative could potentially eliminate gear conflicts and problems with single stock management issues. For example, if there is a portion of the Gulf of Maine allocated for cod fishing and the GOM cod stock needs strict management, this area could be shut down, allowing all other fishing to continue. This alternative may encourage fishermen to change the way they fish to use reduced-impact gear more frequently. This alternative would be intended to protect known important habitats that need protection from adverse impacts associated with certain fishing gear types. Gear conflicts, especially between mobile gear and fixed gear fishermen, would be minimized. This measure could be used as an alternative to setting maximum size gear restrictions for rockhopper and roller gear.

Not enough information exists for all areas to implement this measure consistently throughout the region. At present, the distribution of sediment types is poorly known and is not adequate for allocating fishing gears in many areas of the Gulf of Maine and southern New England shelf. Fishing gear areas identified based on our current knowledge of sediment distribution would be unreliable. Given the information limitations, this approach to management may not be possible at this time. Once better (even if it is not perfect) sediment and fishing effort distribution information is available, this approach could be revisited. This type of alternative could complicate actual and perceived allocation issues, especially with the recreational sector. Depending on the areas and assigned gears, this alternative could disrupt traditional fishing practices (traditional gears fishing in traditional areas). For these reasons, this alternative was considered but rejected.

5.0 Environmental Impacts of the Management Alternatives

The impacts of the proposed management alternatives are described in this section. Expected impacts are considered in four broad categories:

Biological impacts: the effect on fishing mortality, bycatch and bycatch mortality, and protected and threatened species

Economic impacts: the effects of the proposed measures on revenues and costs in the fishery, and the impacts of those changes on other entities in coastal communities

Social impacts: the effects of the proposed measures on fishing communities and participants in the fisheries affected by the FMP

Habitat impacts: the effects of the proposed measures and the extent to which they will minimize the adverse effects of fishing on essential fish habitat

5.1 Analytic Approach and Limitations

The Council is proposing changes to address several broad issues: rebuilding overfished stocks, ending overfishing, addressing requirements to minimize bycatch and/or bycatch mortality, tuna purse seine access to groundfish closed areas, expanding the area for the northern shrimp fishery, authorizing a general category scallop fishery exemption area in southern New England, and numerous administrative measures. Analyses are grouped in the same manner, but the emphasis is on analysis of the measures designed to control fishing mortality. In the case of measures designed to control fishing mortality, the impacts of measures are analyzed by combining the measures as much as possible. This is because many of the proposed measures interact with each other and analyzing the measures individually does not capture the true impact of adopting a suite of measures. Where possible, quantitative impacts are estimated, but the Council has limited ability to quantify the impacts of some of the indirect management measures proposed in this framework. As a result, most alternatives are a combination of quantitative and qualitative analysis. Some management measures are included in several alternatives. Where this occurs, the detailed analysis is only described the first time the measure appears in an alternative. In later alternatives, the measure is referenced and its effects summarized.

5.1.1 Closed Area/Effort Control Analysis

One of the primary analytic tools used to analyze both the biological and economic impacts of the proposed alternatives to achieve mortality objectives is the closed area model. Changes in mortality brought about by area closures and revised trip limits were projected through a non-linear programming model using the General Algebraic Modeling System (GAMS). This closed area model allocates effort to specific block, month combinations for each vessel holding a valid year 2001 multispecies permit, and landing groundfish during the time period 1998 - 2001. A four year period is used to smooth out any peaks or valleys in the data. Data used by the model includes average catch per unit effort (CPUE) by species, gear type, block and month, prices by species and month, and effort by vessel and month. Vessels are assigned a specific gear type based on which gear they used to land the majority of their groundfish catch between 1998 and 2001. Cod discards were included in the CPUE figures for each block and time period because cod had several different trip limit regulations during the time period. All prices were deflated to 1996 levels in order to remove the influence of inflation from the analysis. The model attempts to maximize revenue for each vessel by allocating their effort to the highest revenue blocks. However, because the revenue functions embedded in the model are downward sloping, effort stops flowing to a block when marginal revenue hits zero. The model can also be modified to incorporate changes in allowable days at sea, trip limits, differential days at sea and changes in CPUE by species and stock area.

An initial model run was made based on the no action management regime. The no action alternative includes year round and seasonal area closures which are already in place, the 400 pound GOM cod daily trip limit, and caps effort for each vessel at their average effort level between 1998 and 2001. Additional model runs are then made based on proposed changes in seasonal and year round area closures, changes in trip limits, and changes in days at sea under each management option. The estimated catch stream from each option is then compared to the no action catch stream, and the percentage change in landings is calculated. These numbers should be interpreted as the percent change in exploitation brought about by the proposed management action using the conditions which existed during the 1998-2001 time period. Changes in the exploitation rate can then be interpreted as equivalent changes in mortality. However, results should be interpreted cautiously because some conditions may have changed which are not reflected in the base year data. Additionally, there is variability around the estimates which is not fully captured by the model. One weakness of the model is the uncertainty about catch rates that result from opening areas that have been closed for a lengthy period of time. This is most problematic when changing the boundaries of year round closed areas. Because there is limited trip information in the closed area, the closed area model may under-estimate the catch rates that will result when an area closed to year round fishing is re-opened. This is less of a problem for seasonal closures, since the model incorporates recent trip information that reflects the catch rates that result immediately after opening an area. An advantage of the model is that unlike the "no displacement" analysis of closed areas (that is, assuming that effort in a newly closed area does not fish in another location), it assumes fishing effort moves out of a closed area into an open area based on rational decisions to maximize revenue. A second advantage is that the model output can include predicted impacts on revenues, and this can be broken down by gear sector and tonnage class of vessel. *The model is a simulation of behavioral responses to changes in fishery regulations. It should not be interpreted as a precise calculation of future fishing mortality. While the model output results in apparently precise numerical estimates, it is better to interpret these as broad indicators of relative changes, rather than as precise predictions of mortality impacts. Small percentage changes, for example, should be viewed as less likely relative outcomes than large percentage changes. For stocks where the Council is implementing measures to make large reductions in fishing mortality, it should be clear that the results of the measures will have to be carefully monitored to make sure the objectives are achieved. The model may not capture the exact response of fishermen to the regulations and as a result may over or under estimate the realized impacts.*

As noted earlier, the percentage results should be interpreted as indicators of the relative change in exploitation between options, and not as precise predictions of the result. Changes in exploitation must be converted to a change in fishing mortality in order to determine if mortality objectives are being met. When large reductions in mortality are needed, the PDT uses the criteria that if the estimated reduction is within ten percent of the needed reduction, the proposed measures are successful. The closed area output includes information on the revenues of individual vessels, and this is used in the analysis of economic impacts of the alternatives (section 5.4).

5.1.2 Combination of Quantitative Results

While the closed area model is the primary analytic tool used to estimate impacts of management measures, other models are used as well. The closed area model results show changes in exploitation, while the model used for estimating the impacts of mesh change shows reduction in fishing mortality. Prior to combining the results from these two models, the changes in exploitation are converted to percentage reductions in fishing mortality.

When quantitative impacts are calculated for more than one measure, they are not additive because the measures interact with each other. They are combined by first calculating a multiplier value for each, then by multiplying those values together. The multiplier is determined from the following formula:

Multiplier = 1 – (Estimated F reduction)

Both of these issues are considered in the summary of biological impacts at the end of each alternative. The summary tables show impacts on fishing mortality for GOM cod and GB cod.

5.1.3 Limitations

Analysis of the impacts of the proposed management alternatives is complicated by the following factors.

- The range of proposals and the interaction between management measures precludes analysis of the components on both large and small scales.
- The impacts of changes in trawl mesh size on fishing mortality cannot be accurately estimated for reasons explained in following sections.
- The impacts of minor changes in the boundaries of year round closed areas cannot be quantified. In addition, the catch rates that will result from large changes in the boundaries of year round closures are unknown, making it difficult to estimate the impacts of changes to the Closed Area II and the Western Gulf of Maine Closed Area.
- Many of the management measures interact with each other. Whenever possible, the impacts of each alternative are analyzed as a combination of measures, usually by using the closed area model. When estimates of fishing mortality reductions are obtained from different analytic techniques, they cannot be summed to obtain an estimate of the overall impacts. This is partly because the measures interact with each other, even if analyzed separately.
- The impacts of some measures in the alternatives cannot be quantified. When possible, impacts are expressed in a combination of quantitative and qualitative terms.
- There is limited ability to model long-range economic impacts. Any attempt to model economic impacts into the future assumes no changes in the structure of the economy in the interim. This is an unrealistic assumption over the time periods associated with the rebuilding plans.
- There is limited ability to estimate the economic impacts of changes to the recreational fishing measures. There is both a lack of available data and lack of an ability to predict how recreational fishermen will react to changes. The motivations for recreational fishing are many and varied, and predicting changes in recreational fishermen's behavior is nothing more than guesswork.
- Because of very low catches, the closed area model does not calculate changes for ocean pout, halibut, or the southern stock of windowpane flounder.
- The closed are model was designed to estimate impacts of input controls. It is an imperfect tool for modeling the impacts of hard TACs.

5.2 Biological Impacts of the Alternatives

5.2.1 Rebuilding Strategies

The following sections show the expected trajectories of spawning stock biomass for the proposed action and alternative rebuilding strategies. Trajectories are shown for those stocks with required formal rebuilding plans and available age-based projections. The median biomass (or spawning stock biomass) and the inter-quartile range (25^{th} and 75^{th} percentile) are shown on each chart. Projections for stocks assessed through trawl survey and exploitation indices ("index-based stocks") are shown in tables. These tables should be viewed with caution. As noted by SAW 35 (NEFSC 2002c), "Projections are based on linear rates of increase and as such they should not be used to project population trends beyond a few years." This approach, however, is the only one available to indicate likely trends in biomass for index-based stocks.

While the M-S Act measures the success of a rebuilding program as attaining the target biomass level, increases in stock biomass are not the only biological impacts of the rebuilding programs. As fishing mortality is reduced and stock size increases, stocks should see a broadening of the age structure (that is, more individuals at a wider range of ages). Stocks are expected to expand over a broader geographic range, subject to oceanographic conditions. Recruitment – the number of young fish that enter the fishery - is expected to increase for many stocks. Some stocks may expand their geographic range. Density-dependent effects may also develop: for example, slower growth rates due to competition for food, older ages at maturity, etc. There may also be changes in predator-prey relationships. For a general discussion of the type of changes that may occur, see NEFSC (2002a). It is not possible to predict the extent of these changes since many of the target stock sizes (under some of the biomass target options) have not been observed, but the periodic stock assessments should be able to detect them as they occur.

5.2.1.1 Proposed Action

Age-based projections for the proposed action are shown in Figure 46 through Figure 52. These projections reflect a combination of phased and adaptive rebuilding strategies as discussed in section 3.2. For index-based stocks, projected biomass that will result from the phased or adaptive rebuilding strategy are shown in Table 34. As state above, hose tables should be viewed with caution. As noted by SAW 35 (NEFSC 2002c), "Projections are based on linear rates of increase and as such they should not be used to project population trends beyond a few years." This approach, however, is the only one available to indicate likely trends in biomass for index-based stocks.

As noted in the introduction to this section, increases in stock biomass are not the only expected biological effects of rebuilding. See NEFSC 2002a for a general discussion of the likely impacts.

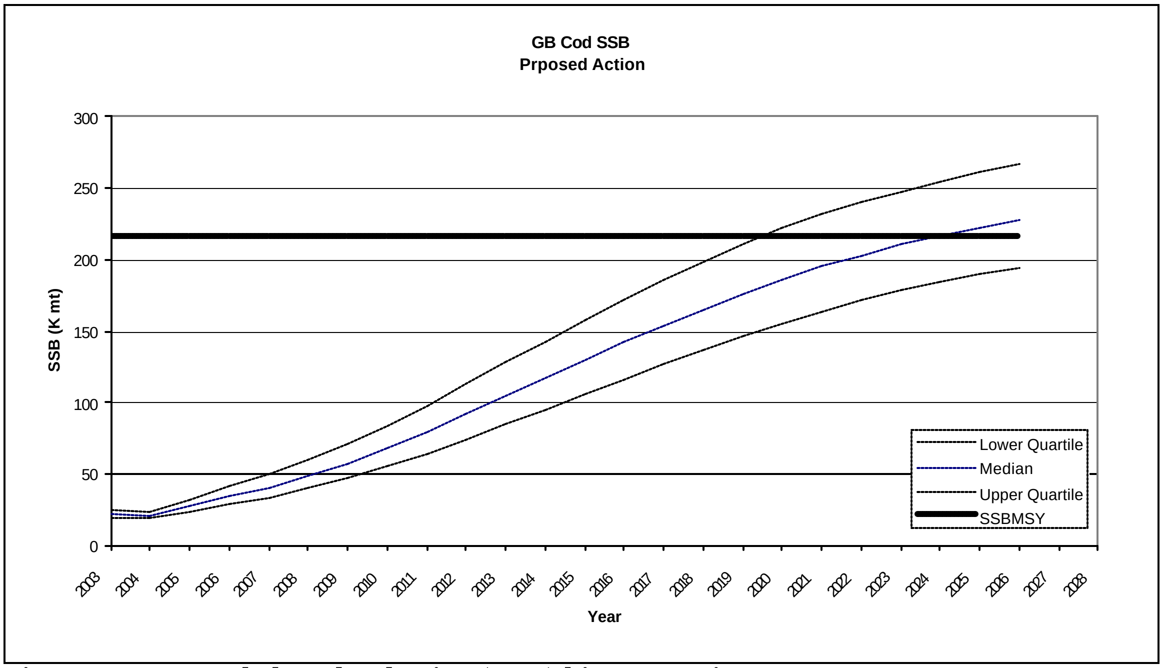


Figure 46 – GB cod phased reduction (2014) biomass trajectory

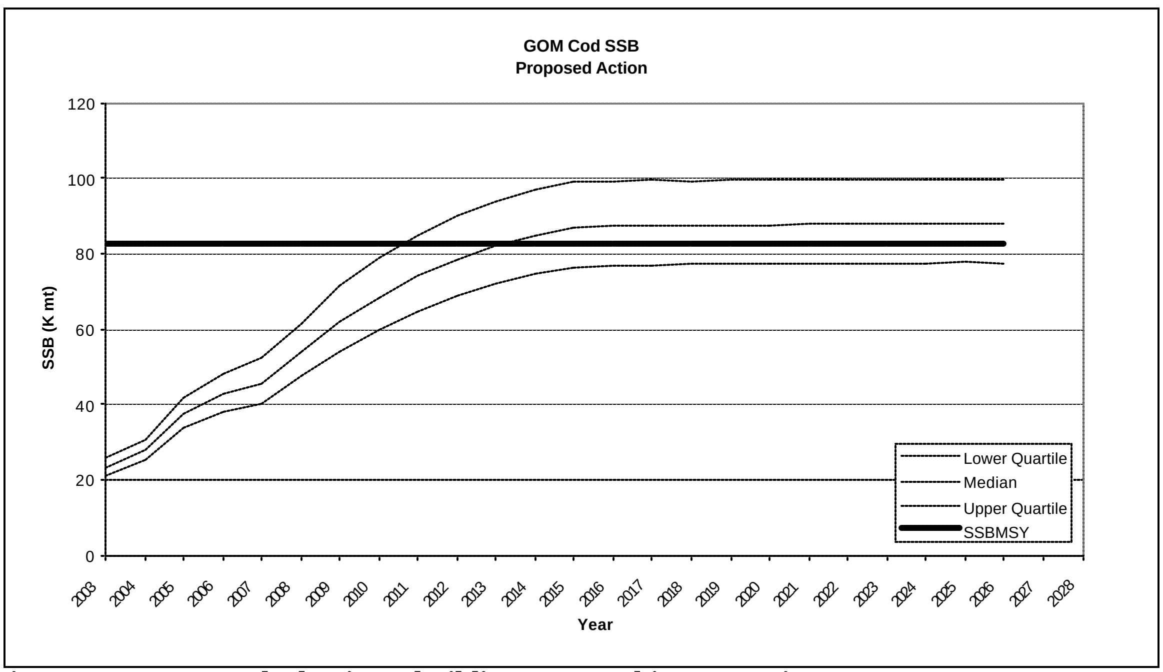


Figure 47 – GOM cod adaptive rebuilding strategy biomass trajectory

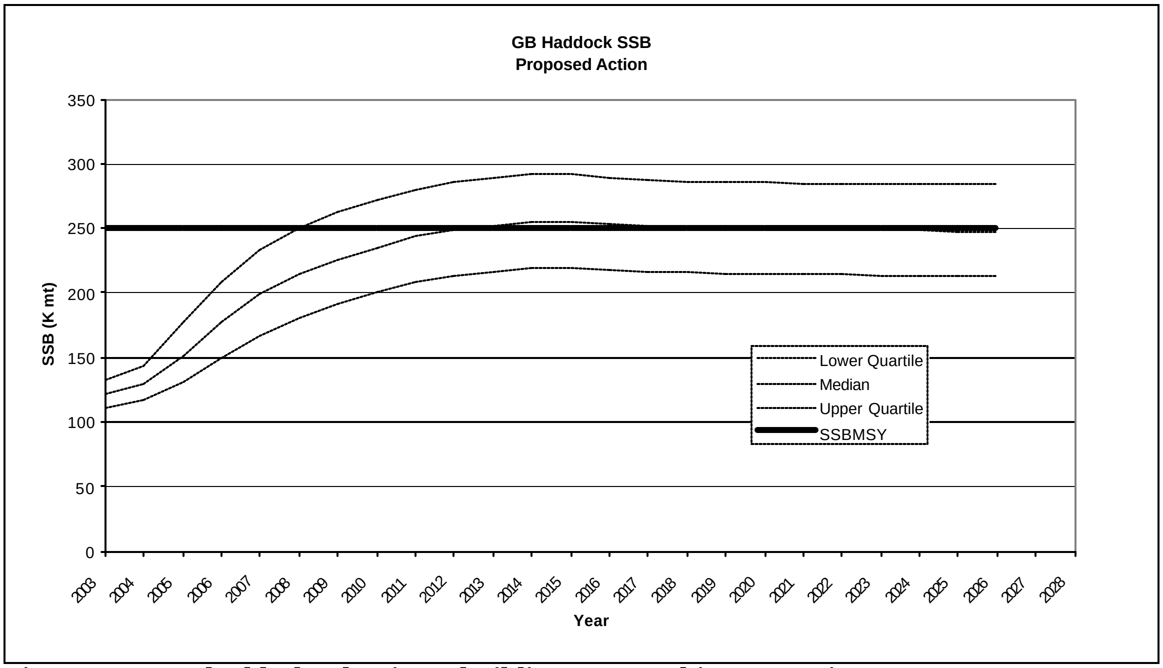


Figure 48 – GB haddock adaptive rebuilding strategy biomass trajectory

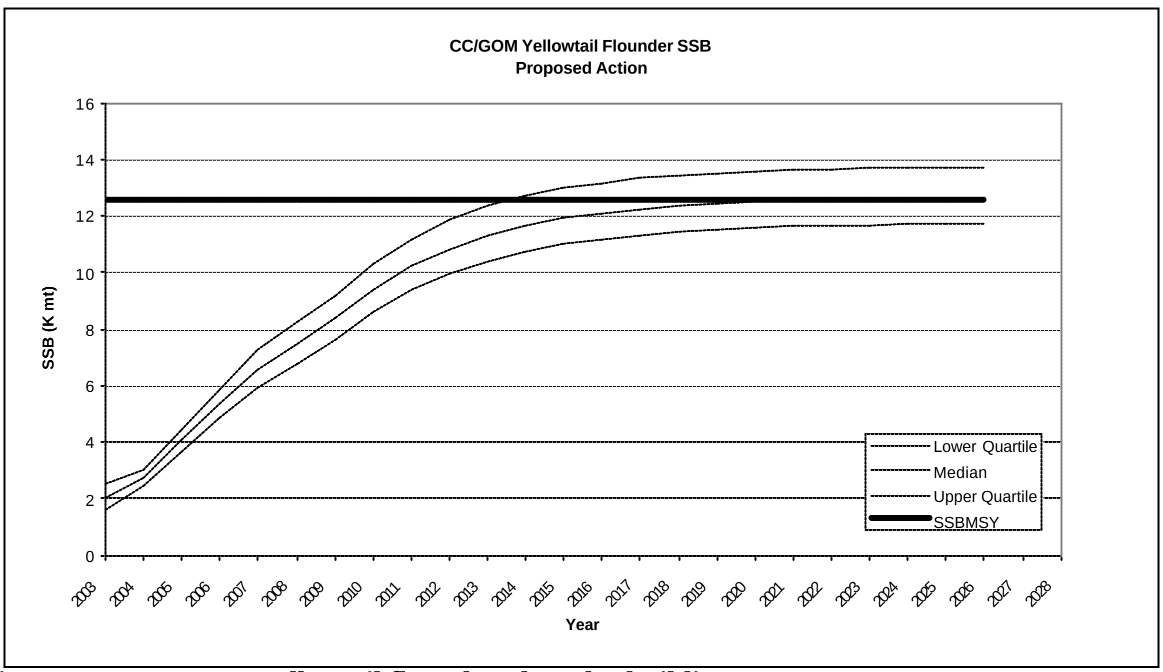


Figure 49 – CC/GOM yellowtail flounder phased rebuilding strategy

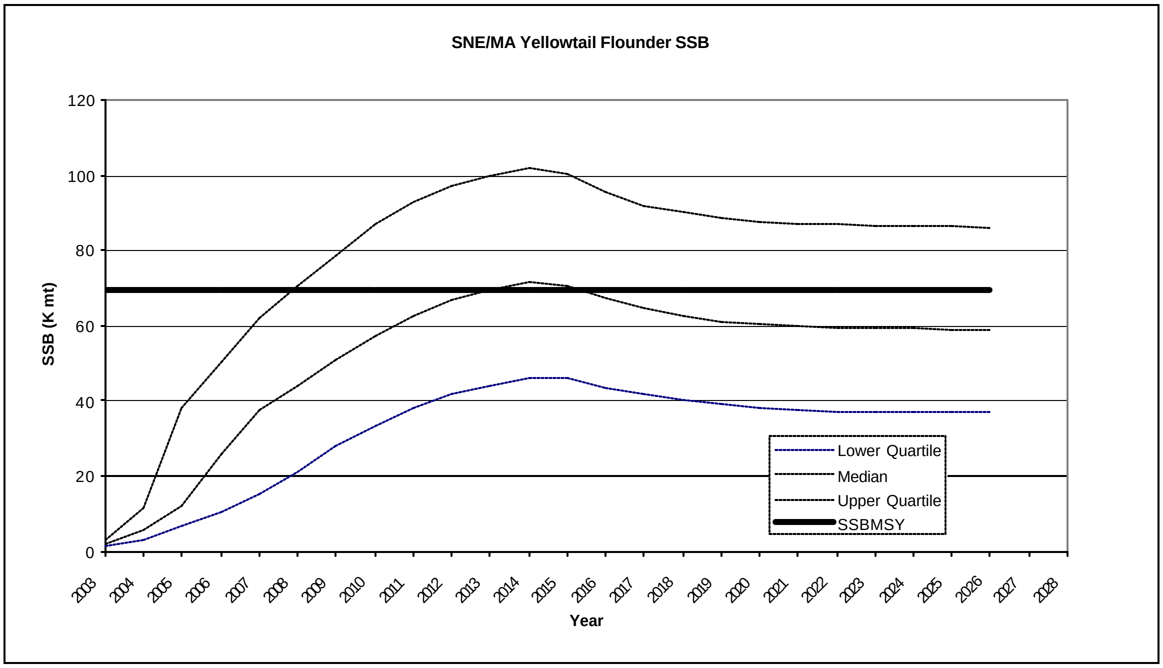


Table 33 – SNE/MA yellowtail flounder phased rebuilding strategy

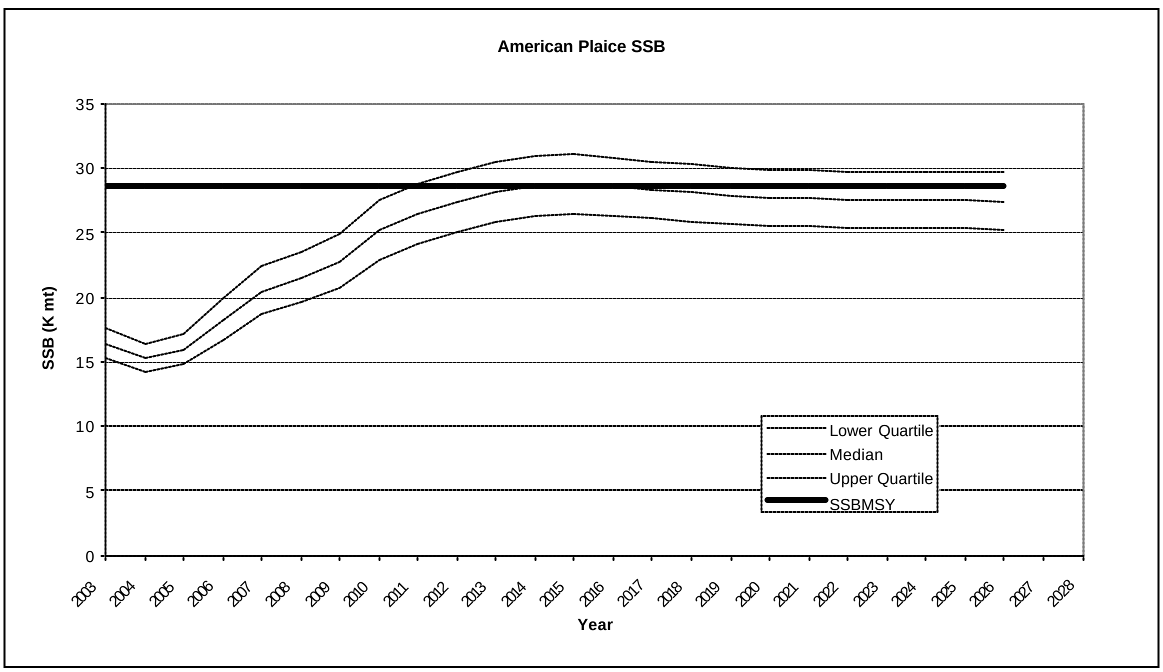


Figure 50 – Plaice phased reduction (2014) biomass trajectory

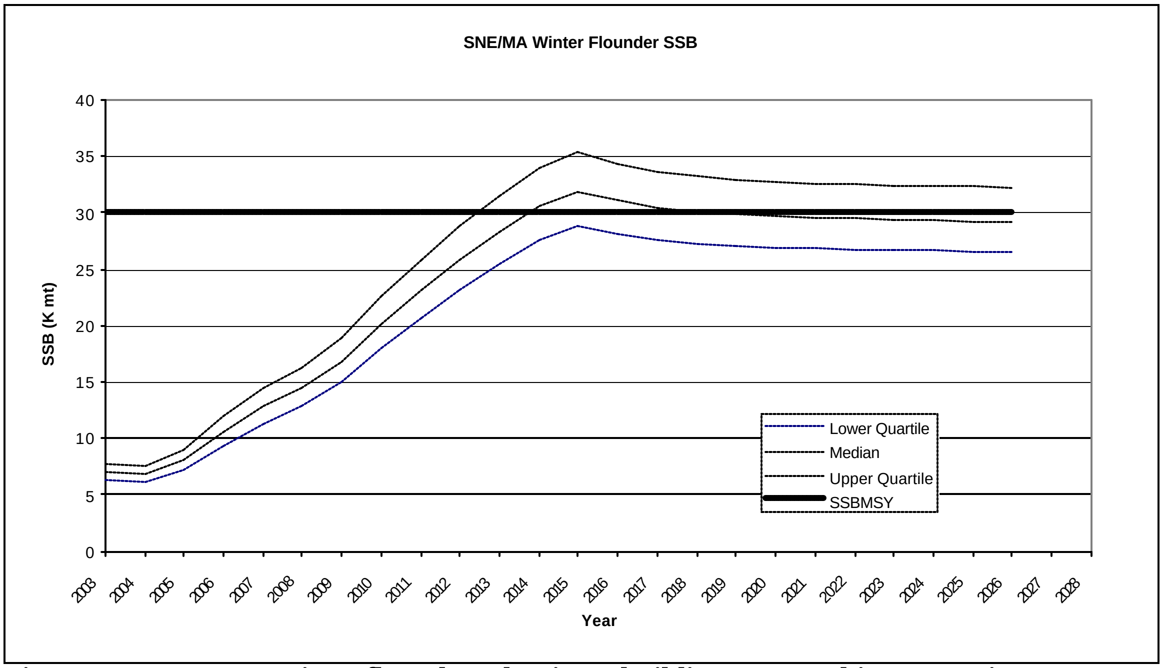


Figure 51 – SNE/MA winter flounder adaptive rebuilding strategy biomass trajectory

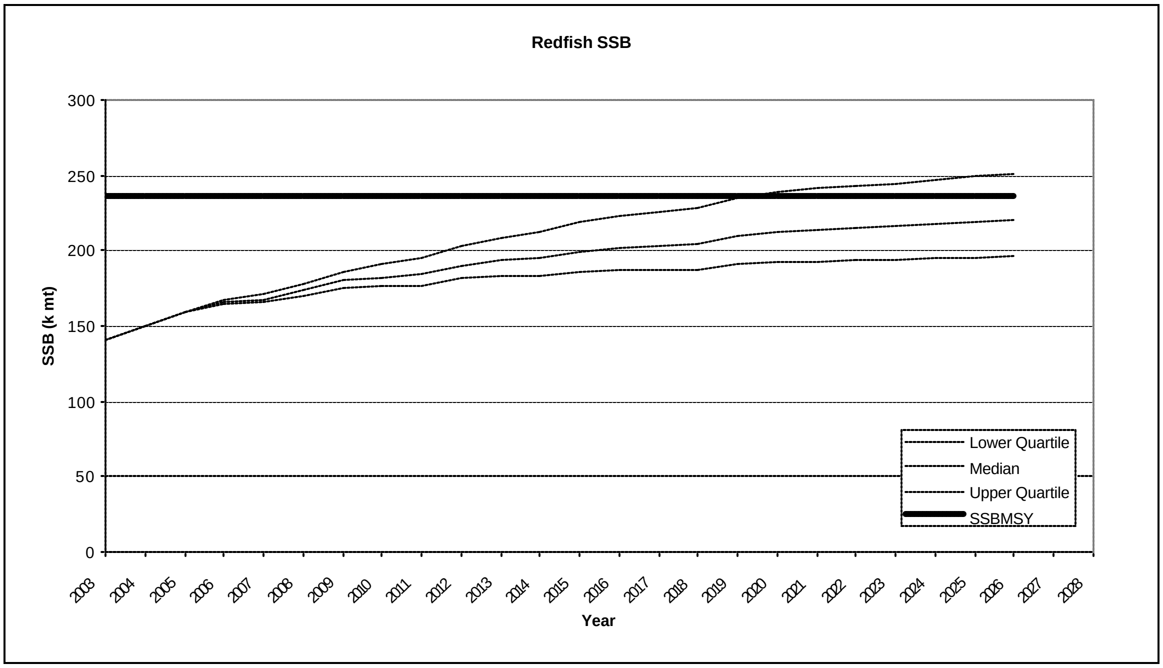


Figure 52 – Redfish adaptive rebuilding strategy

Year	*GOM Haddock*	*Ocean Pout*	*Southern Windowpane*	*White Hake all sizes*	*White Hake >60cm*
2002	11.5410	2.2533	0.2400	7.1387	3.3657
2003	21.4267	2.5832	0.3027	7.1073	2.7441
2004	21.0032	2.5832	0.2904	7.0760	2.2373
2005	20.5881	2.5832	0.2787	7.0448	1.8241
2006	20.1812	2.5832	0.2674	7.0138	1.4872
2007	19.7823	2.5832	0.2566	6.9829	1.2125
2008	19.3913	2.5832	0.2462	6.9521	0.9886
2009	19.8290	2.8741	0.3067	7.6143	1.3919
2010	20.2765	3.1977	0.3820	8.3395	1.9596
2011	20.7342	3.5578	0.4759	9.1338	2.7590
2012	21.2021	3.9584	0.5928	10.0037	3.8845
2013	21.6807	4.4041	0.7385	10.9565	5.4690
2014	22.1700	4.9000	0.9200	12.0000	7.7000
Average	***19.9851***	***3.1265***	***0.4075***	***8.2587***	***2.8480***

Table 34 – Projected stock size for index based stocks (appropriate survey index estimates shown)

5.2.1.2 No Action

Age-based projections under the No Action alternative (that is, fishing mortality rates observed in FY 2001) are shown in figures Figure 53 through Figure 62, while the index-based stock trajectories are shown in Table 35. Evaluation of the No Action alternative depends in part on the choice of biomass targets (see section 3.1.6.2). Under the No Action alternative, while many stocks continue to increase, most of the stocks with required rebuilding programs will not achieve the target biomass (SSB_{MSY} or B_{MSY}) recommended by the reference Point Working Group (NEFSC 2002a; see Option 1 of section 3.1.6.2). The exceptions are GOM haddock, GB haddock and redfish, because fishing mortality in 2001 was at or below the mortality needed to rebuild these stocks. For different biomass targets, however, the No Action alternative will achieve the target for more stocks. Table 36 summarizes the year that the three biomass target options will be achieved under this alternative.

Year	Northern Windowpane	Gulf of Maine Haddock	Pollock (Area 5 & 6)	White Hake (all sizes)	White Hake (60+ cm)	Southern Windowpane	Ocean Pout
2002	0.86	15.86	1.73	6.70	2.47	0.25	2.46
2003	1.03	33.20	2.07	6.00	1.70	0.27	2.57
2004	0.94	22.17	2.49	5.37	1.17	0.30	2.69
2005	0.94	22.17	2.98	4.80	0.81	0.33	2.82
2006	0.94	22.17	3.58	4.30	0.56	0.36	2.95
2007	0.94	22.17	3.00	3.85	0.38	0.40	3.09
2008	0.94	22.17	3.00	3.44	0.27	0.44	3.23
2009	0.94	22.17	3.00	3.08	0.18	0.48	3.38
2010	0.94	22.17	3.00	2.76	0.13	0.52	3.54
2011	0.94	22.17	3.00	2.47	0.09	0.58	3.71
2012	0.94	22.17	3.00	2.21	0.06	0.63	3.88
2013	0.94	22.17	3.00	1.98	0.04	0.69	4.06
2014	0.94	22.17	3.00	1.77	0.03	0.76	4.25
Target	0.94	22.17	3.00	12.00	7.70	0.92	4.90

Table 35 – Amendment 13 Projected Biomass Indices for Index-Based Groundfish Stocks under the No Action Alternative

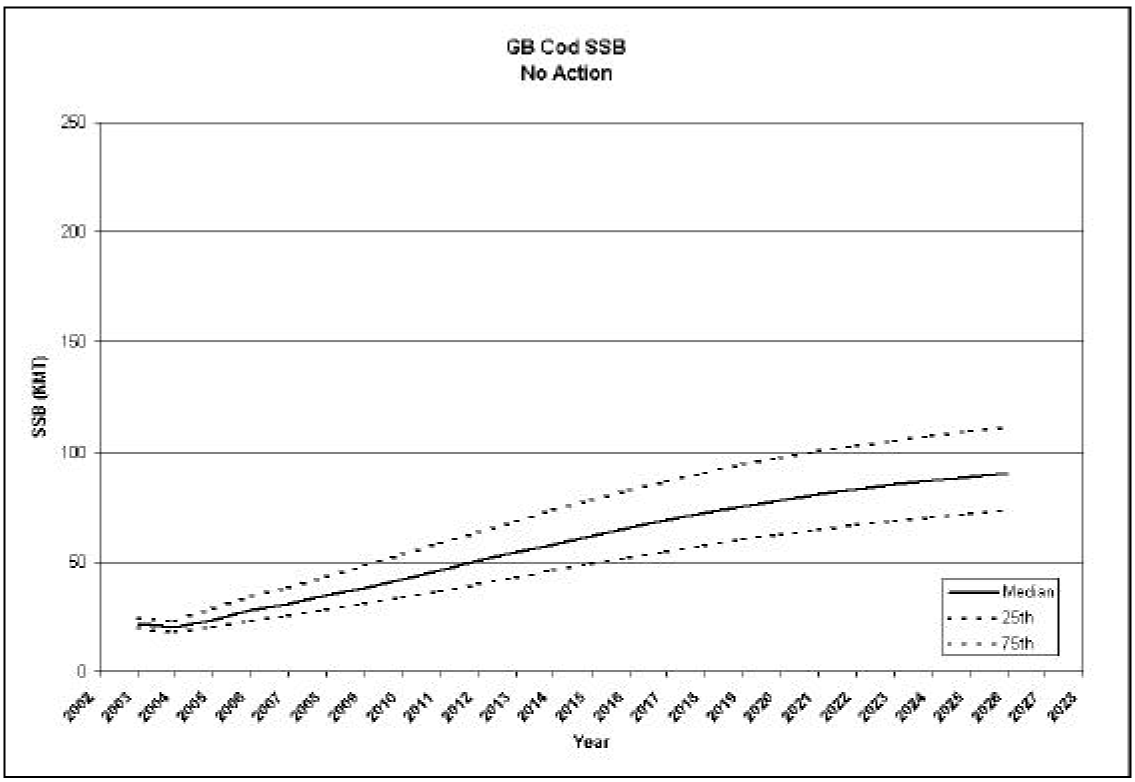


Figure 53 – GB cod no action biomass trajectory

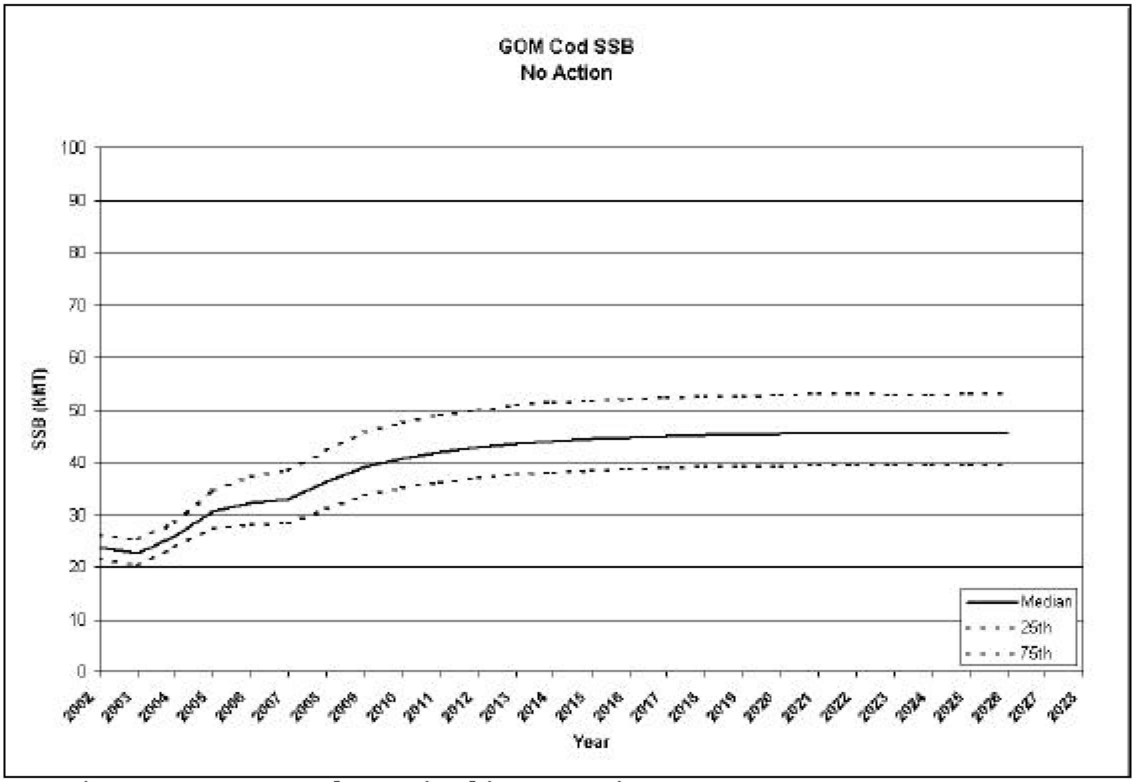


Figure 54 – GOM cod no action biomass trajectory

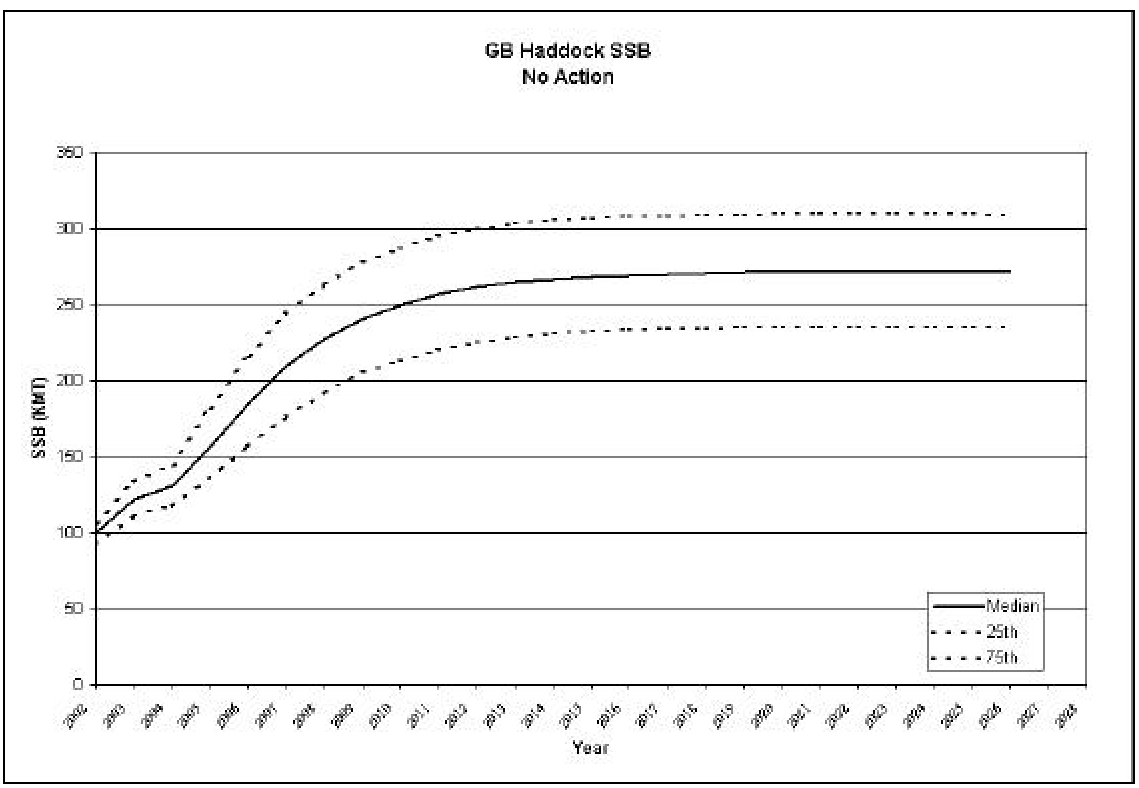


Figure 55 – GB haddock no action biomass trajectory

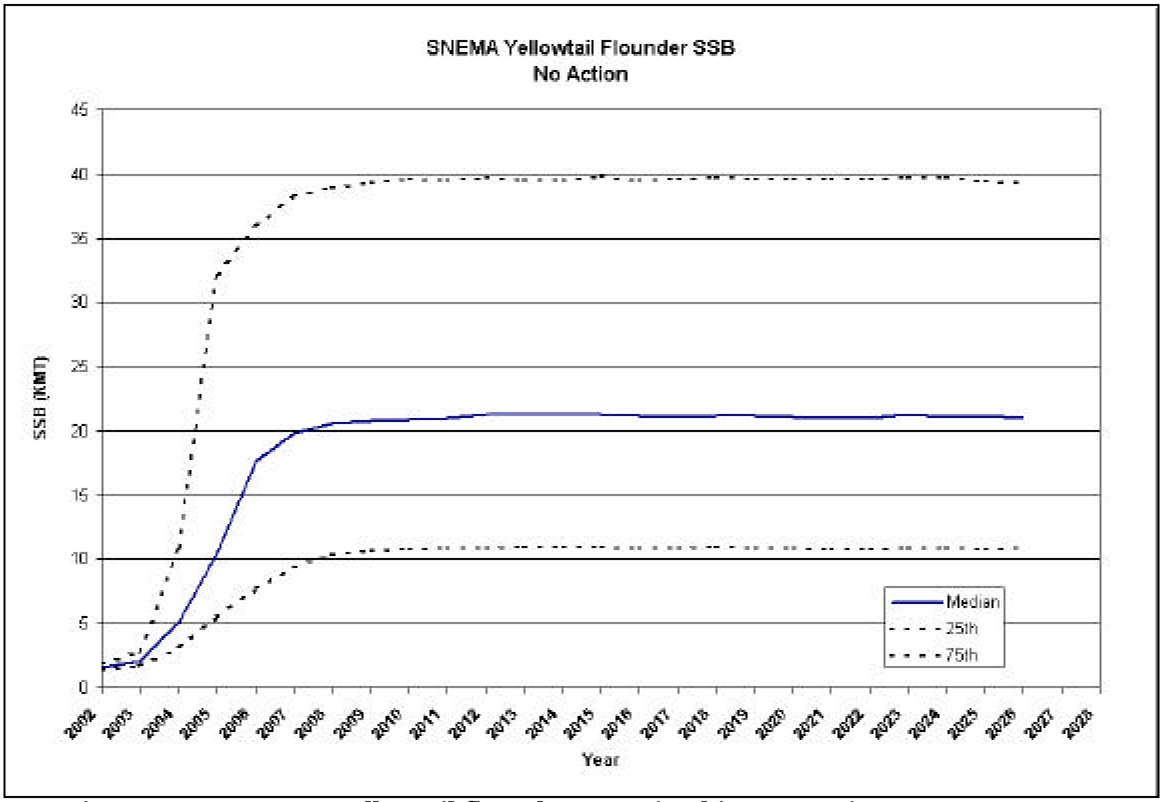


Figure 56 – SNE/MA yellowtail flounder no action biomass trajectory

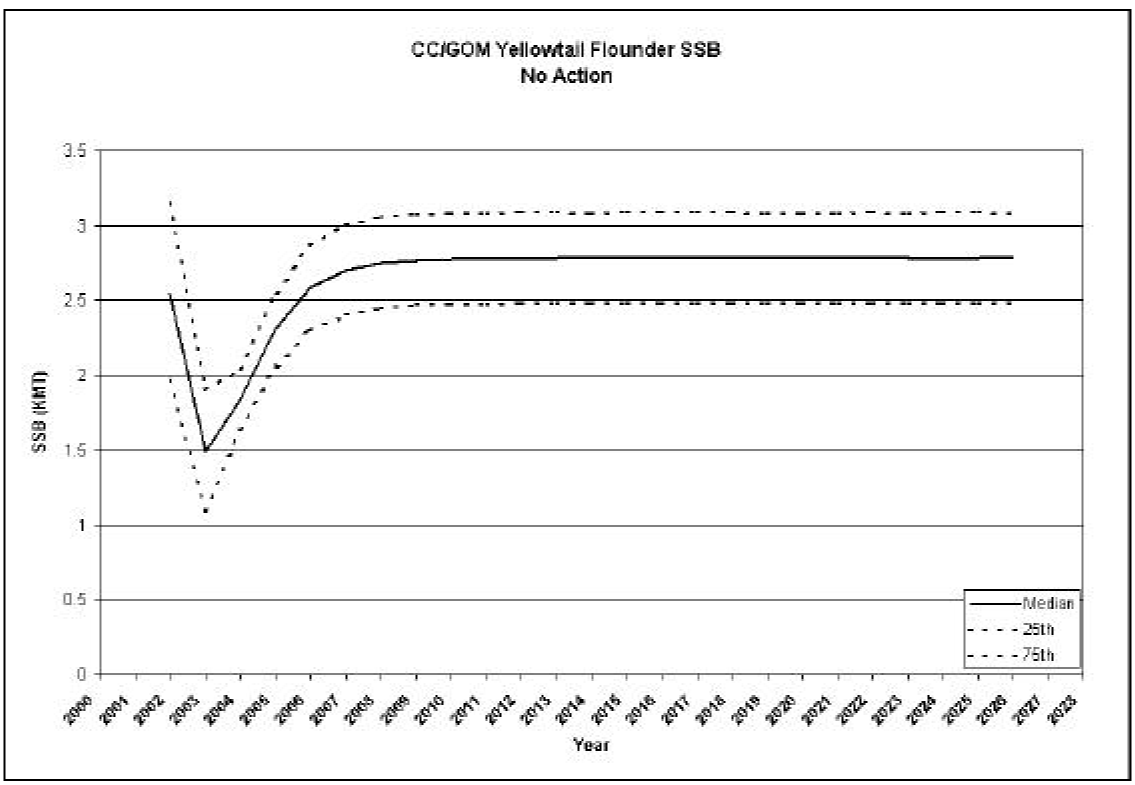


Figure 57 – CC/GOM yellowtail flounder no action biomass trajectory

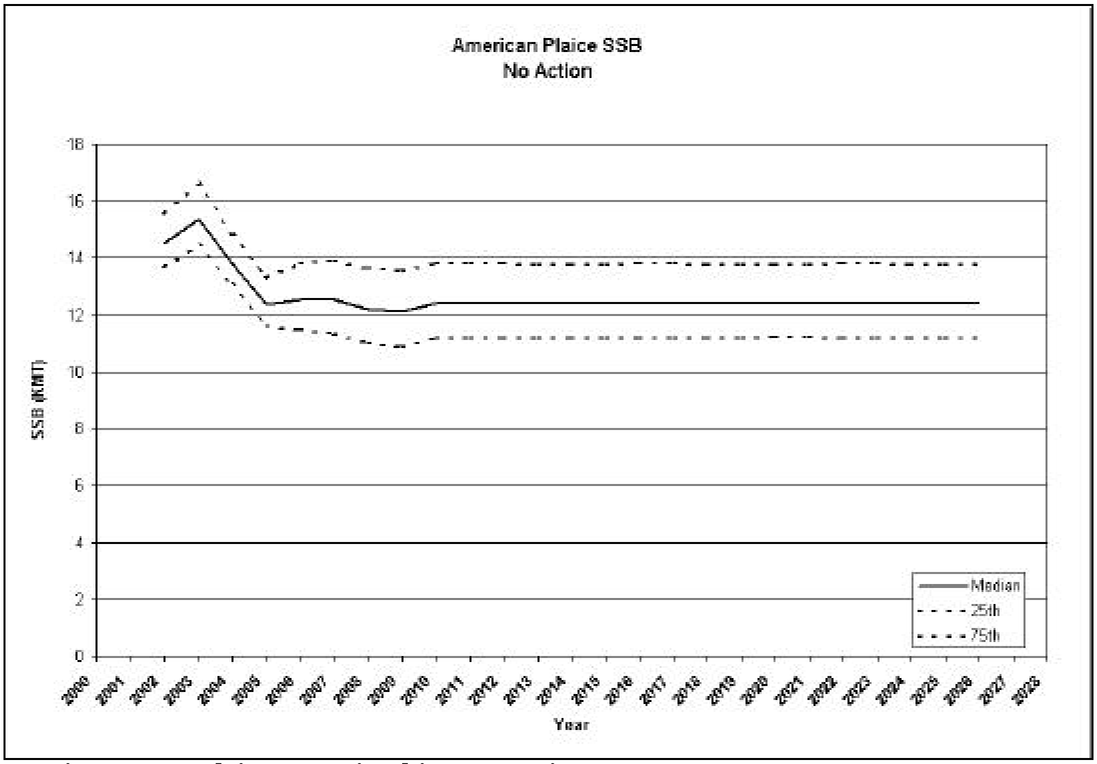


Figure 58 – Plaice no action biomass trajectory

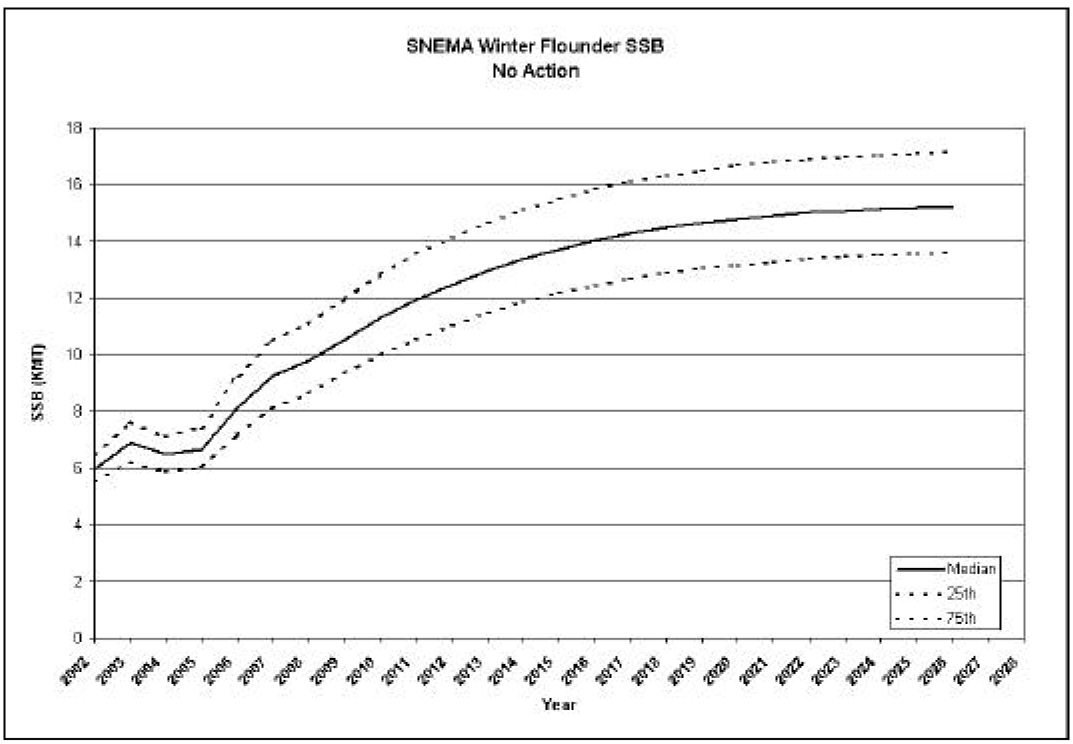


Figure 59 –SNE/MA winter flounder no action biomass trajectory

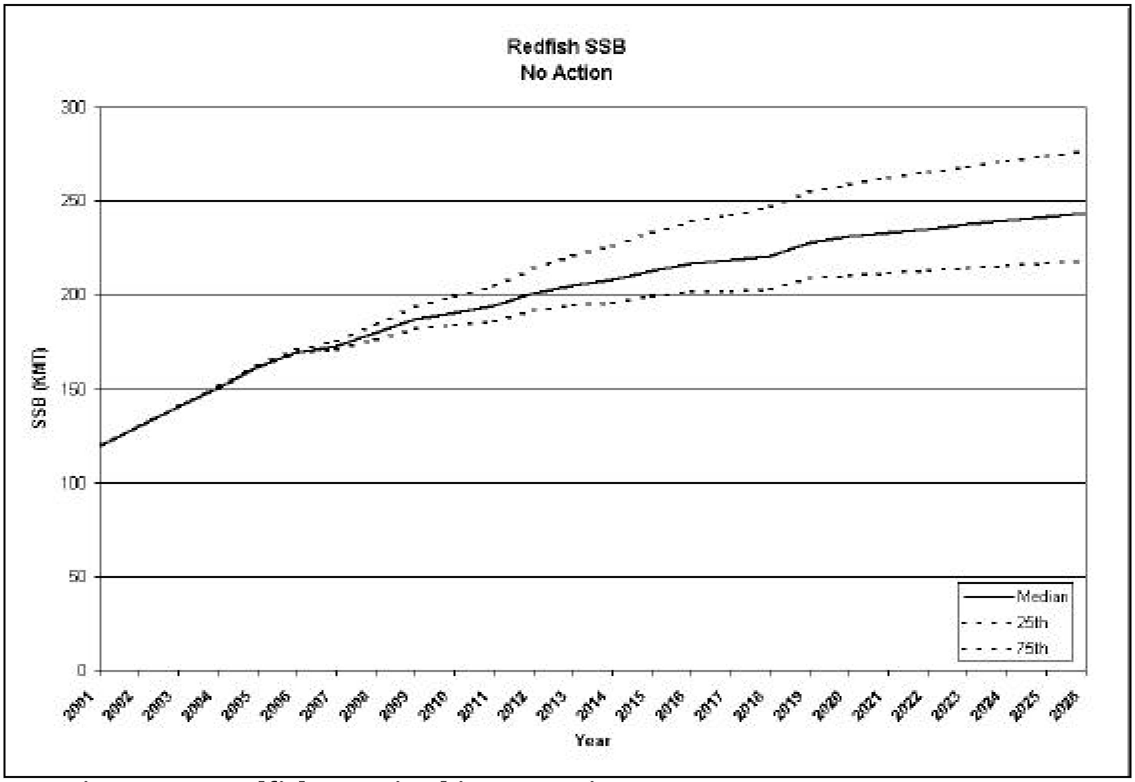


Figure 60 – Redfishno action biomass trajectory

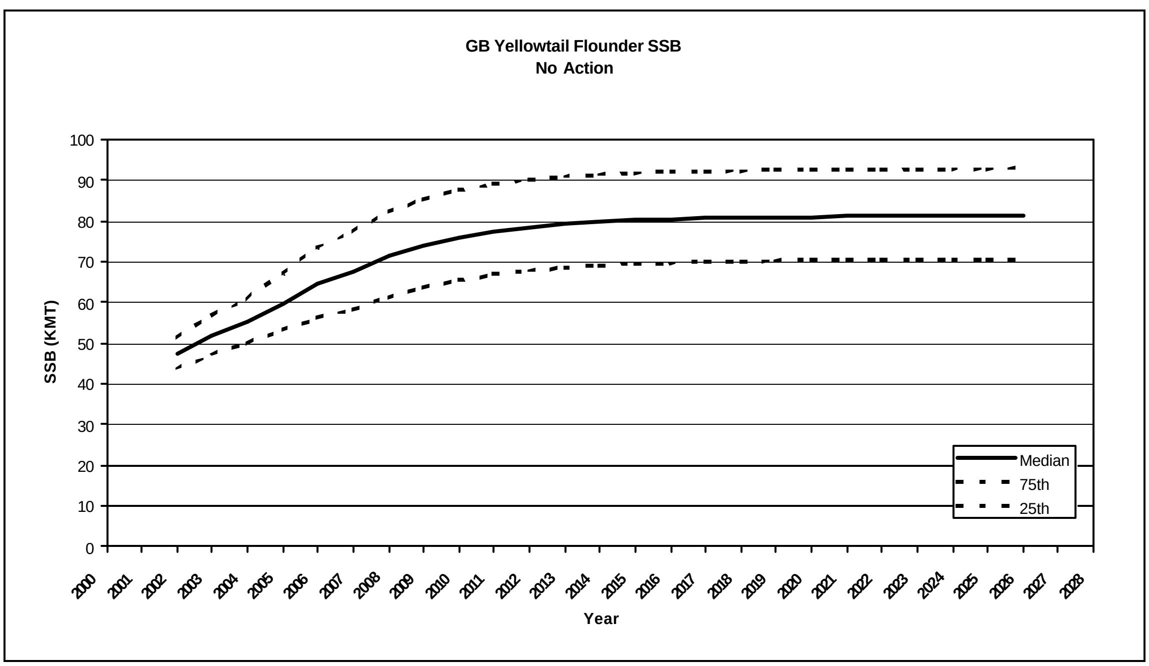


Figure 61 – GB yellowtail flounder no action biomass trajectory

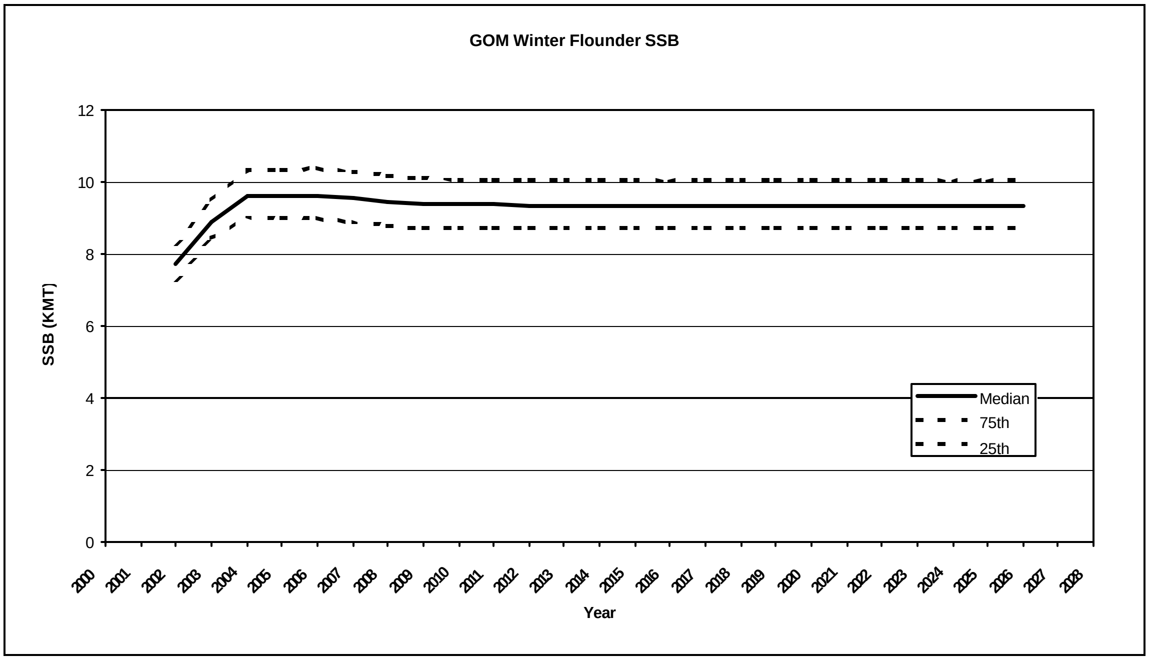


Figure 62 – GOM winter flounder no action biomass trajectory

SPECIES	STOCK	Biomass Target Options					
		Proposed Action		Option 2 - Step Increase		Option 3 - High 3	
		B_{TARGET} (metric tons)	Year Achieved	B_{TARGET} (metric tons)	Year Achieved	B_{TARGET} (metric tons)	Year Achieved
COD	GB	216,800	> 2026 (90,200)	104,375	> 2026	188,900	> 2026
	GOM	82,800	> 2026 (45,500)	27,625	2005	77,500	> 2026
HADDOCK	GB	250,300	2011	131,250	2005	168,700	2006
	GOM	22.17 kg/tow	2004	10.3 kg/tow	< 2002	22.17 kg/tow	2004
YELLOWTAIL FLOUNDER	GB	58,800	2005	55,000	2004	39,300	< 2002
	SNE/MA	69,500	Never (20,900)	45,750	Never	69,500	Never
	CC/GOM	12,600	Never (2,800)	5,250	Never	2,000	2005
AMERICAN PLAICE		28,600	Never (12,400)	28,600	Never	19,900	Never
WITCH FLOUNDER		25,240	2003	25,240	2003	19,900	< 2003
WINTER FLOUNDER	GB	9,400(1)	(above target)	9,400 (1)	(above target)	9,400	(above target)
	GOM	4,100	(above target)	4,100	(above target)	4,100	(above target)
	SNE/MA	30,100	> 2026 (15,200)	14,750	2019	30,100	>2026 (15,200)
REDFISH		236,700	2023	135,000	2003	129,100	2002
WHITE HAKE		14,700/ 7.70 kg/tow	Never (0.03)	14,700/ 7.70 kg/tow	Never	14,700/ 7.70 kg/tow	Never
POLLOCK		3.0 kg/tow	2007	3.0 kg/tow	2007	3.0 kg/tow	2007
WINDOWPANE FLOUNDER	North	0.94 kg/tow	2003	0.94 kg/tow	2003	0.94 kg/tow	2003
	South	0.92 kg/tow	> 2014 (0.76)	0.51 kg/tow	2010	0.92 kg/tow	> 2014
OCEAN POUT		4.9 kg/tow	> 2014 (4.25)	4.9 kg/tow	> 2014	4.9 kg/tow	> 2014
ATLANTIC HALIBUT		5,400(1)	Not Available	5,400	Not Available	1.3 kg/tow	Not Available

Table 36 – Year that various biomass targets will be achieved under the No Action rebuilding strategy

Notes:

(1) For stocks marked "never", projections show either a constant or declining stock size in 2026.

(2) For stocks marked " > (year)", projections show stock size continuing to increase to end of projection period, with SSB at end shown in parenthesis. Trajectory after that period is unknown. Index-based projections end in 2014., age-based in 2026 for most stocks.

(3) No method exists to project halibut biomass due to a lack of information.

5.2.1.3 Constant Fishing Mortality (2009)

This alternative is designed to achieve the target biomass for many stocks requiring formal rebuilding programs by 2009. There are exceptions to the list of stocks that must be rebuilt by 2009 for the reasons more fully described in section 3.2.2. GB cod, CC/GOM yellowtail flounder, and redfish have longer rebuilding periods because it is not possible to rebuild by 2009. Plaice and SNE/MA winter flounder rebuild by 2014 because they were not previously identified as overfished. The SSB trajectories for these stocks are the same as those for the constant fishing mortality (2014) option and are not shown in this section.

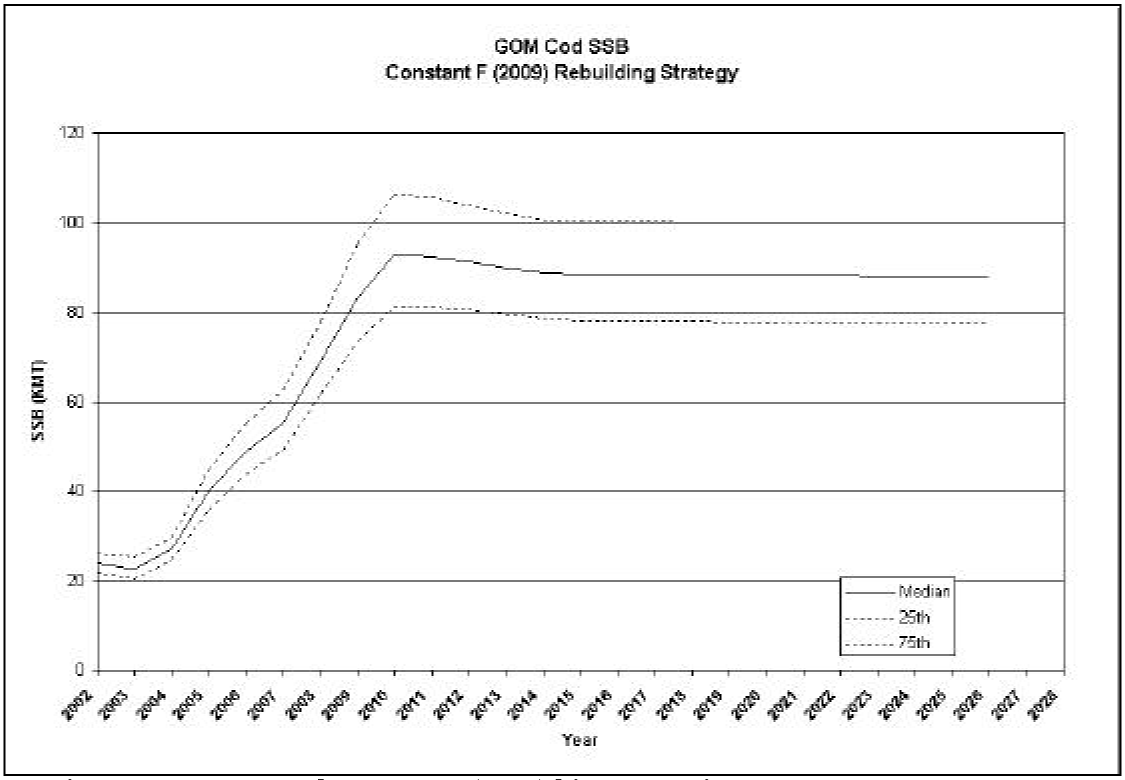


Figure 63 – GOM cod constant F (2009) biomass trajectory

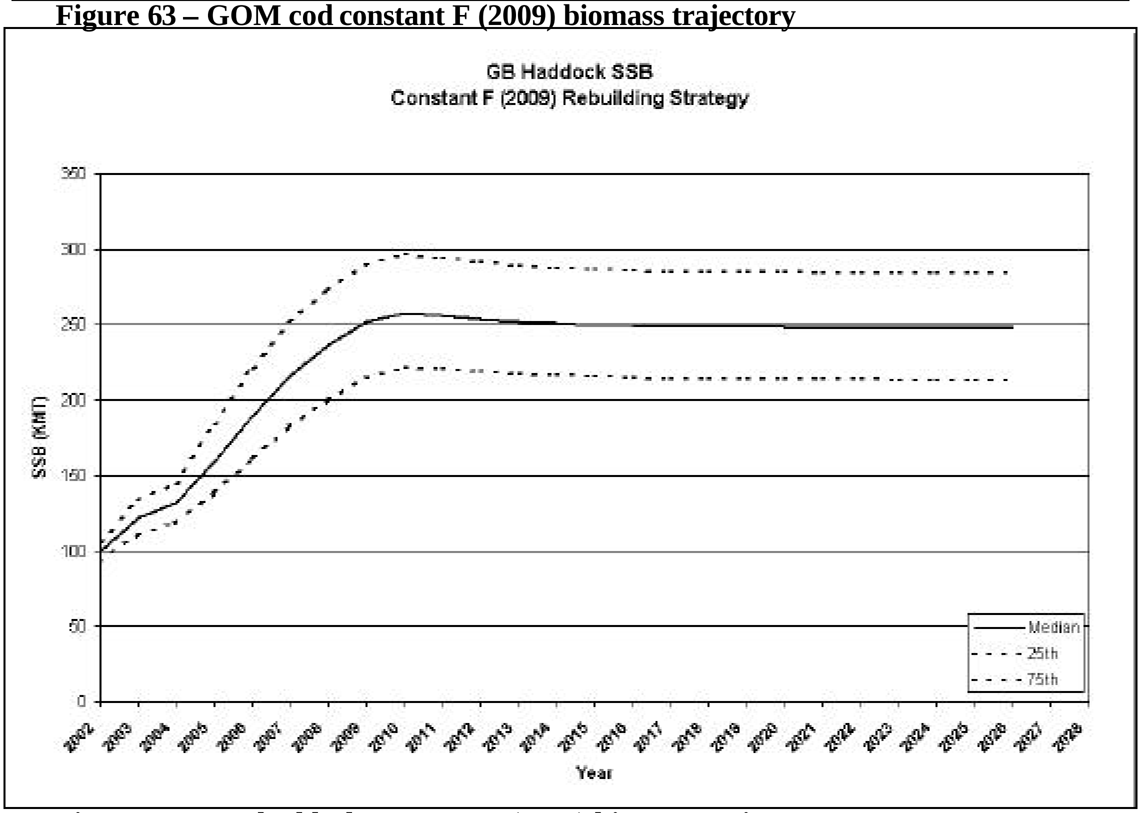


Figure 64 – GB haddock constant F (2009) biomass trajectory

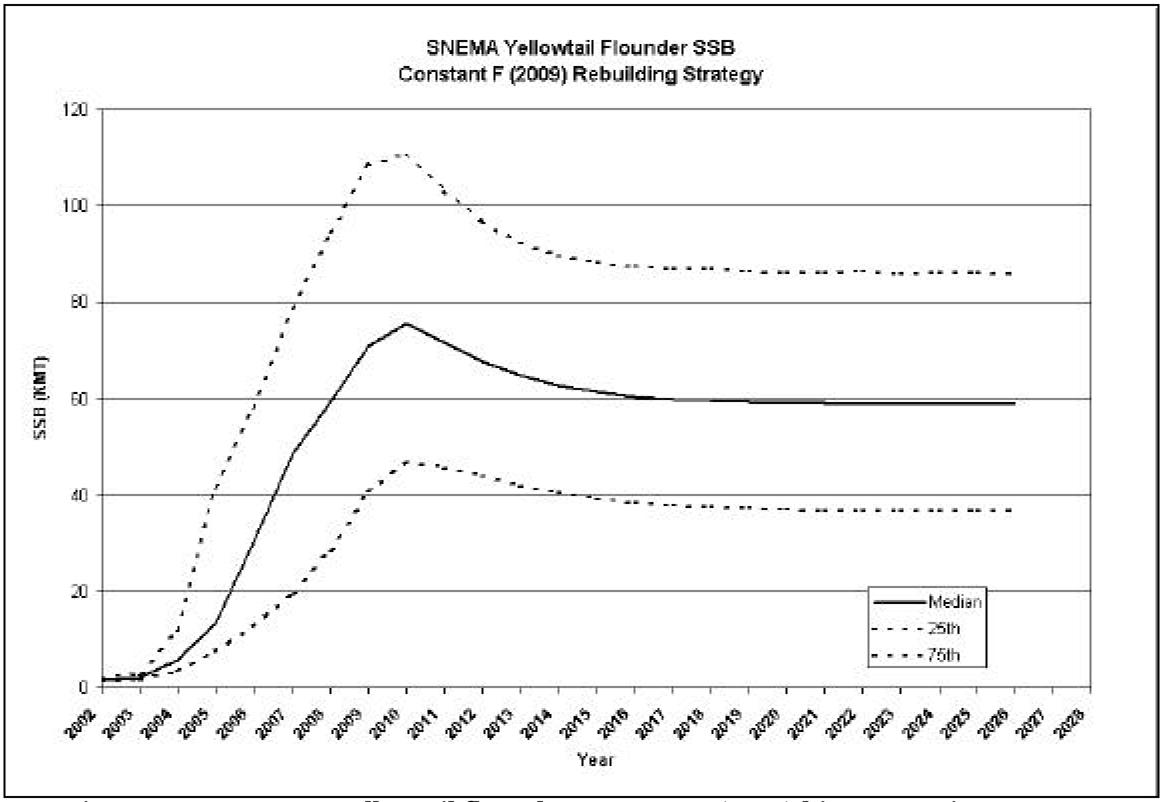


Figure 65 – SNE/MA yellowtail flounder constant F (2009) biomass trajectory

5.2.1.4 Phased Fishing Mortality Reduction (2009)

Biomass targets for many stocks that require formal rebuilding programs are achieved by 2009 under this option. Exceptions include GB cod, CC/GOM yellowtail flounder, redfish, plaice, and SNE/MA winter flounder. Rebuilding trajectories for those stocks are the same as shown for the phased reduction (2014) option and are not repeated.

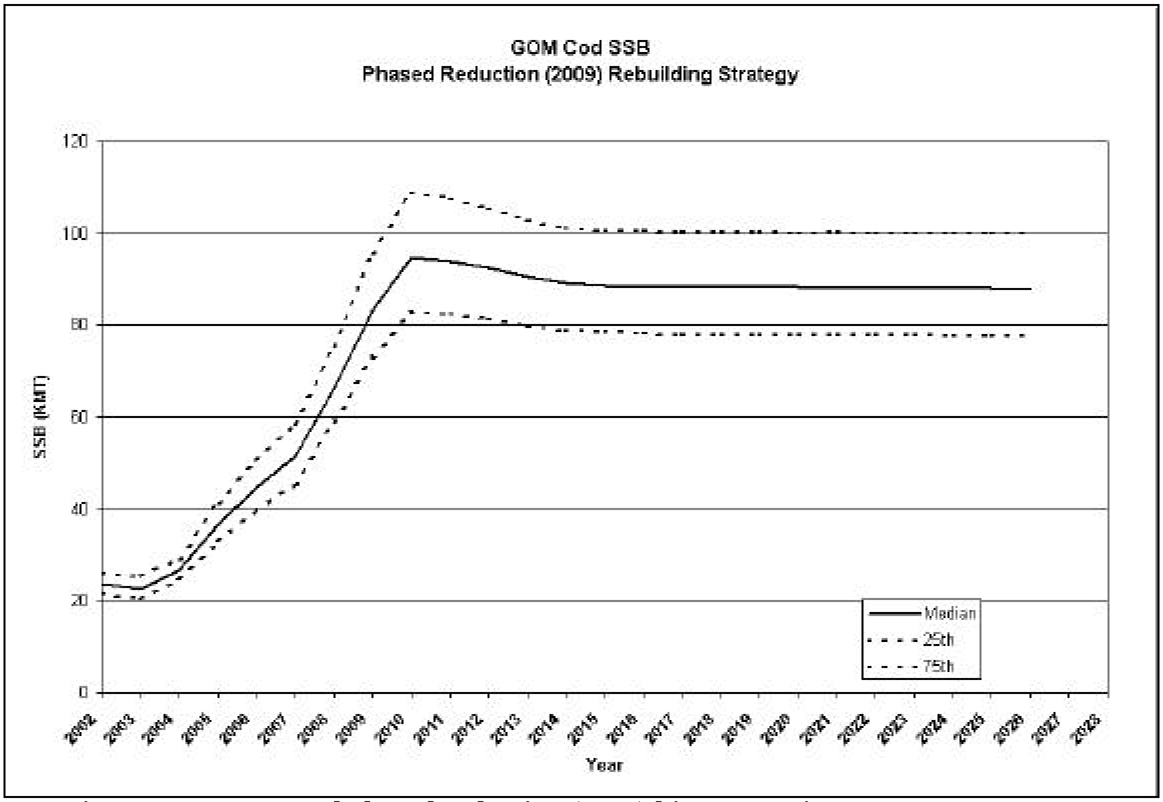


Figure 66 – GOM cod phased reduction (2009) biomass trajectory

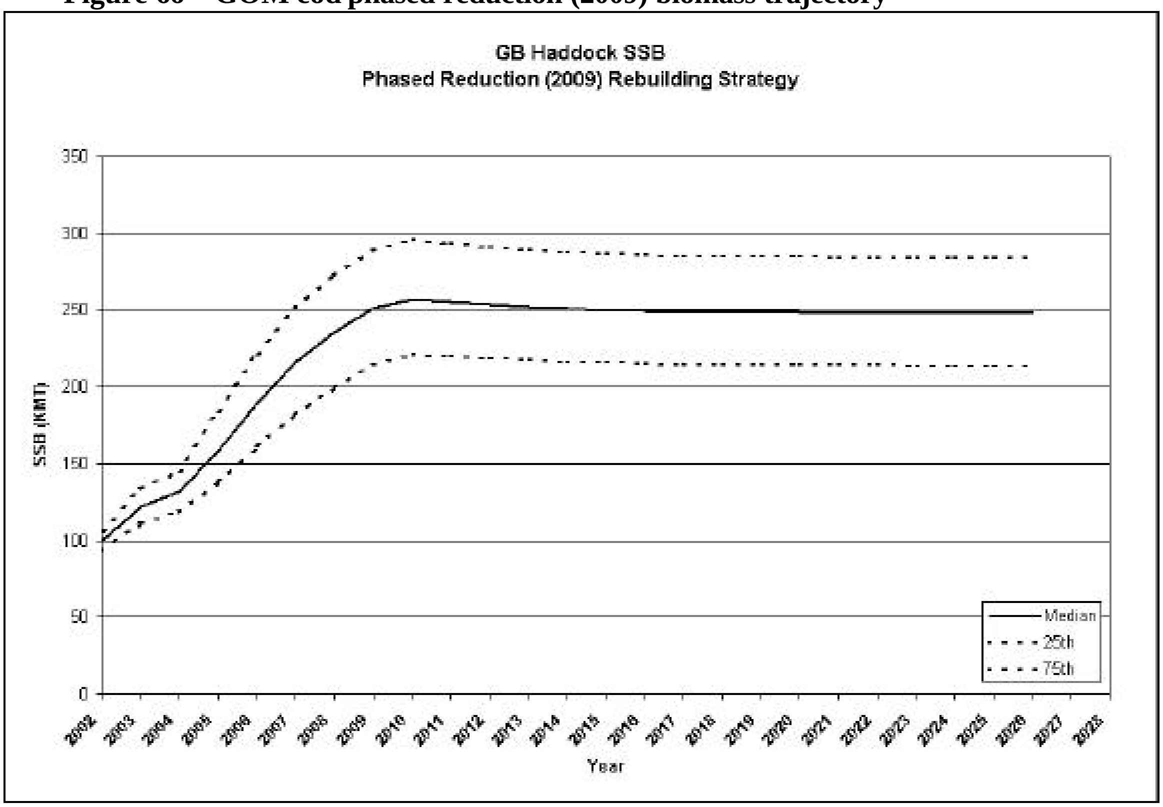


Figure 67 – GB haddock phased reduction (2009) biomass trajectory

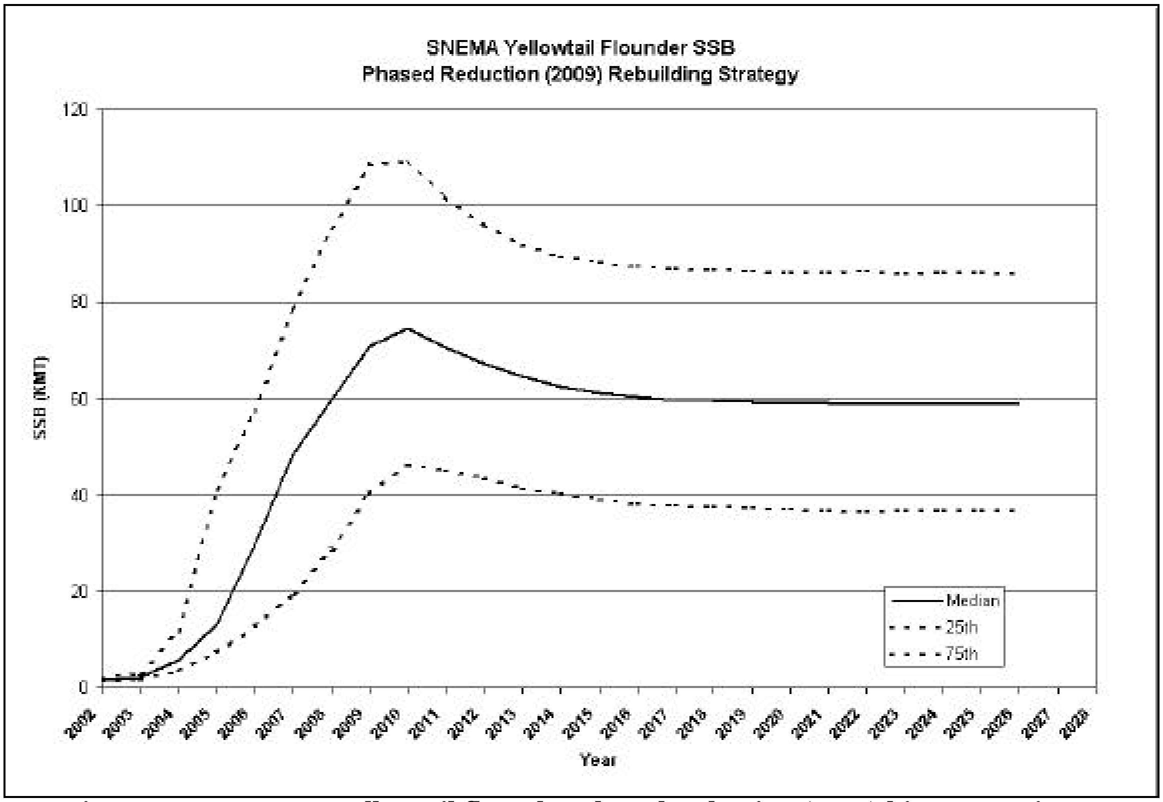


Figure 68 – SNE/MA yellowtail flounder phased reduction (2009) biomass trajectory

5.2.1.5 Constant Fishing Mortality (2014)

Fishing mortality in this option is designed to achieve the target biomass with a median probability by 2014 for most stocks requiring formal rebuilding programs. The exceptions (as described in section 3.2.2) are GB cod, CC/GOM yellowtail flounder, and redfish.

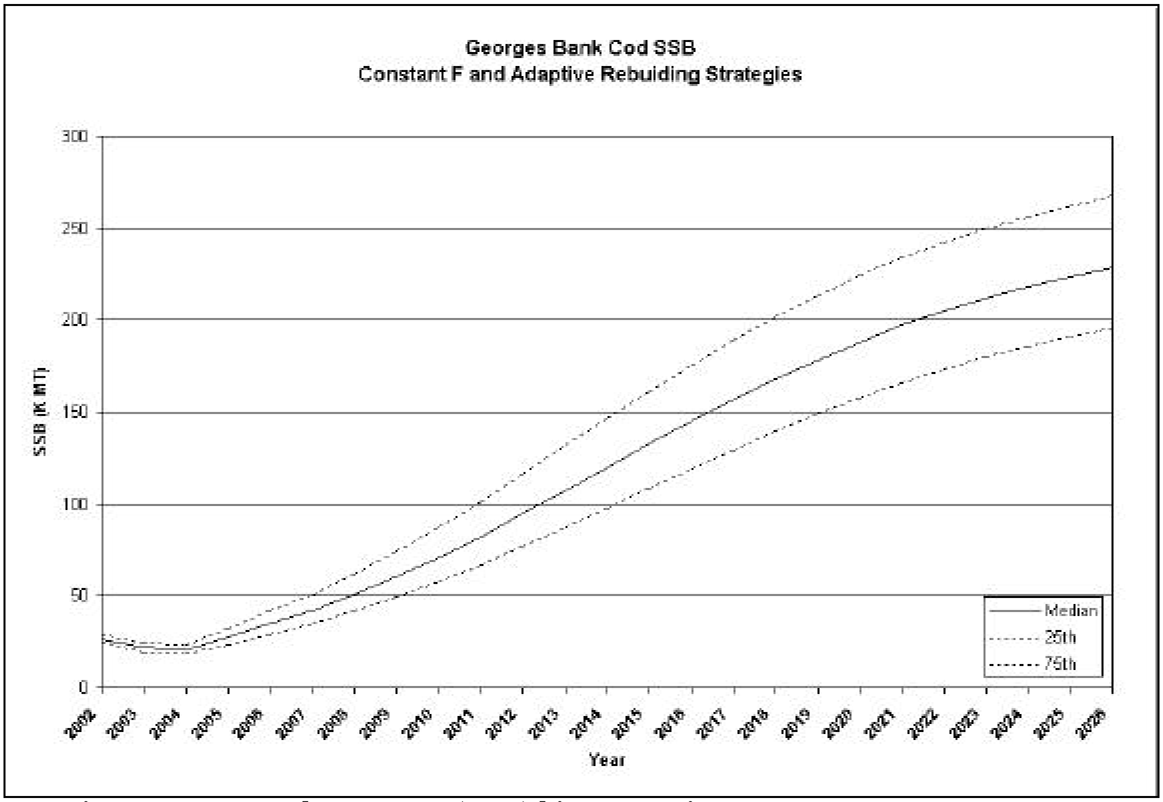


Figure 69 – GB cod constant F (2014) biomass trajectory

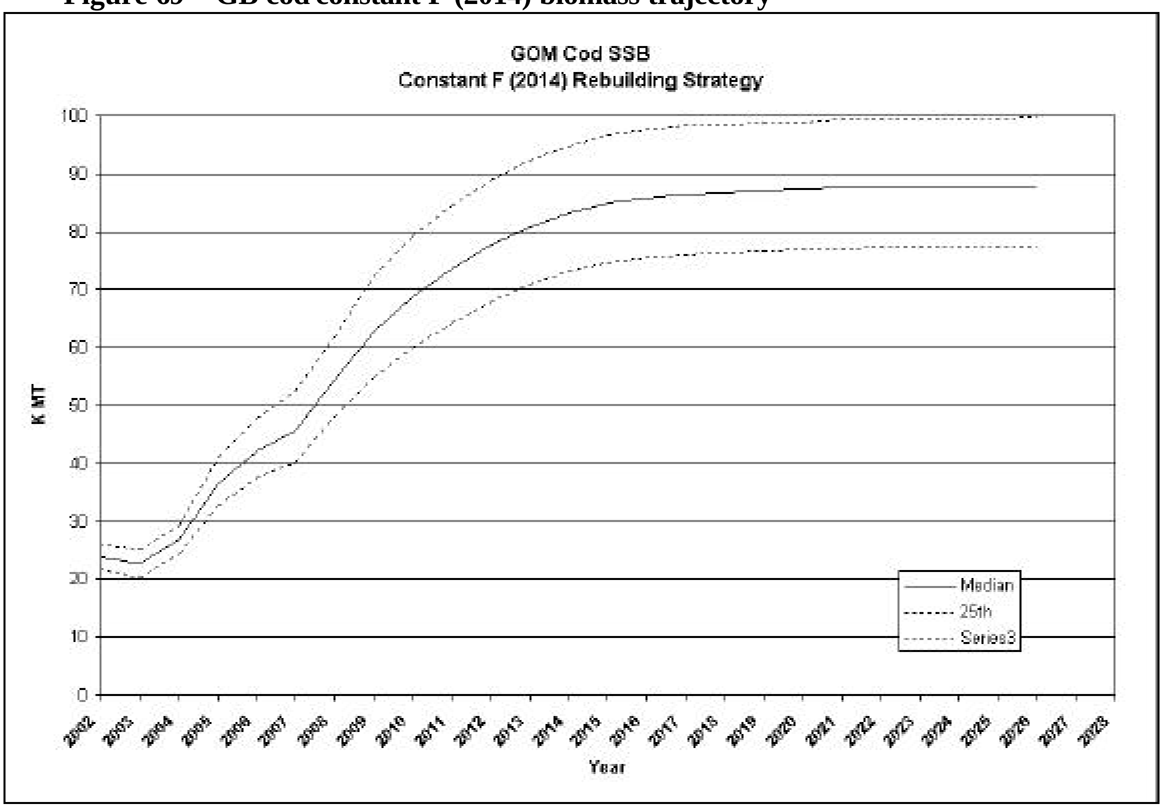


Figure 70 – GOM cod constant F (2014) biomass trajectory

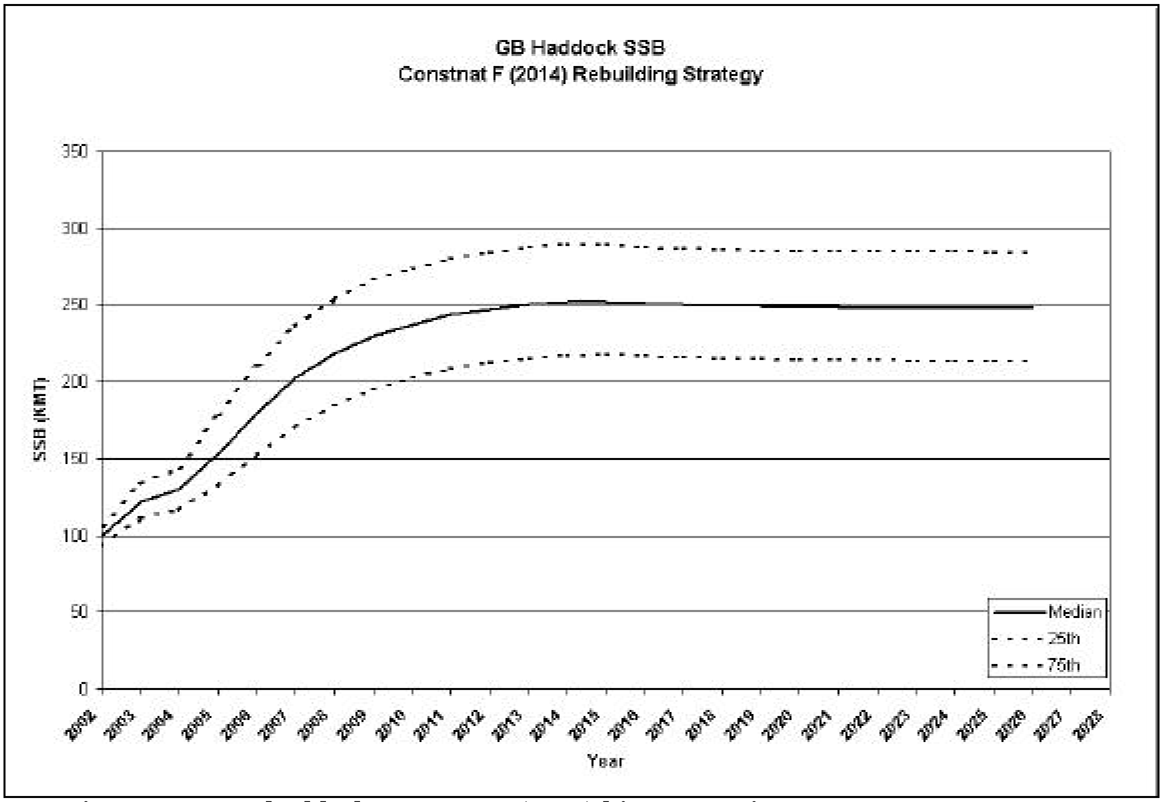


Figure 71 – GB haddock constant F (2014) biomass trajectory

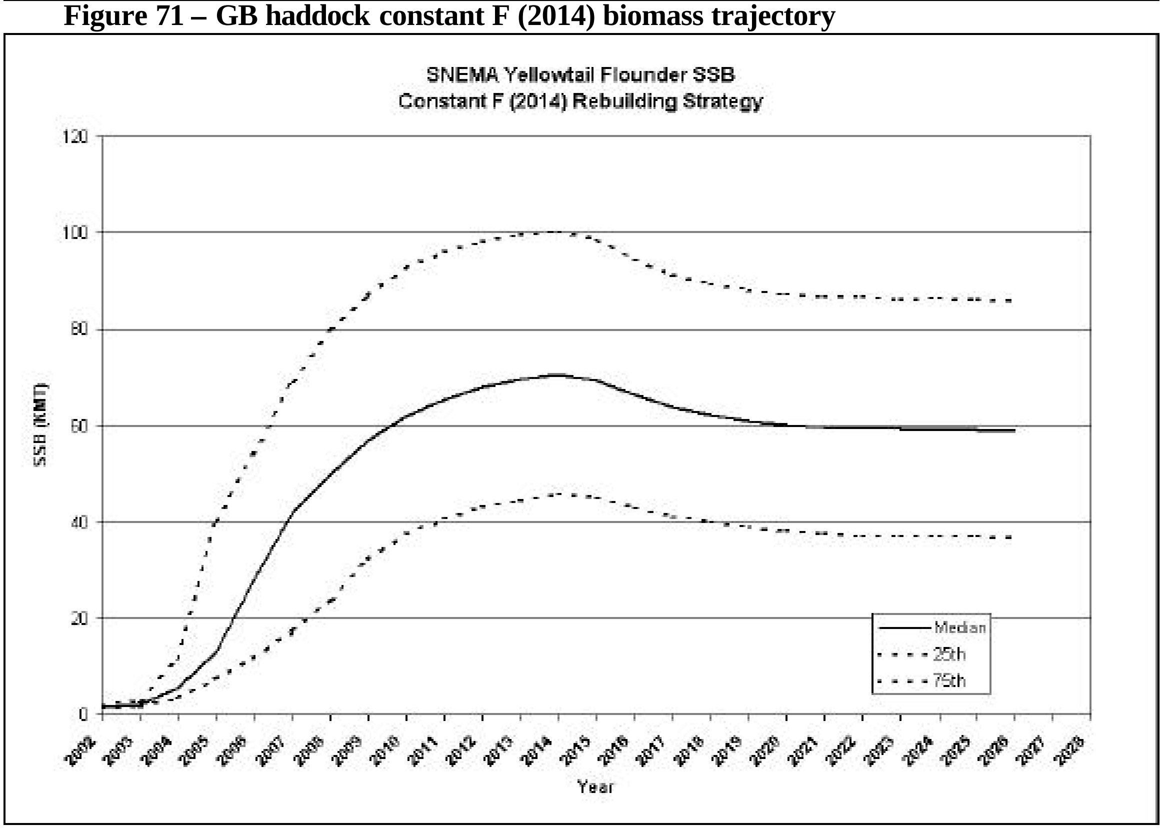


Figure 72 – SNE/MA yellowtail flounder constant F (2014) biomass trajectory

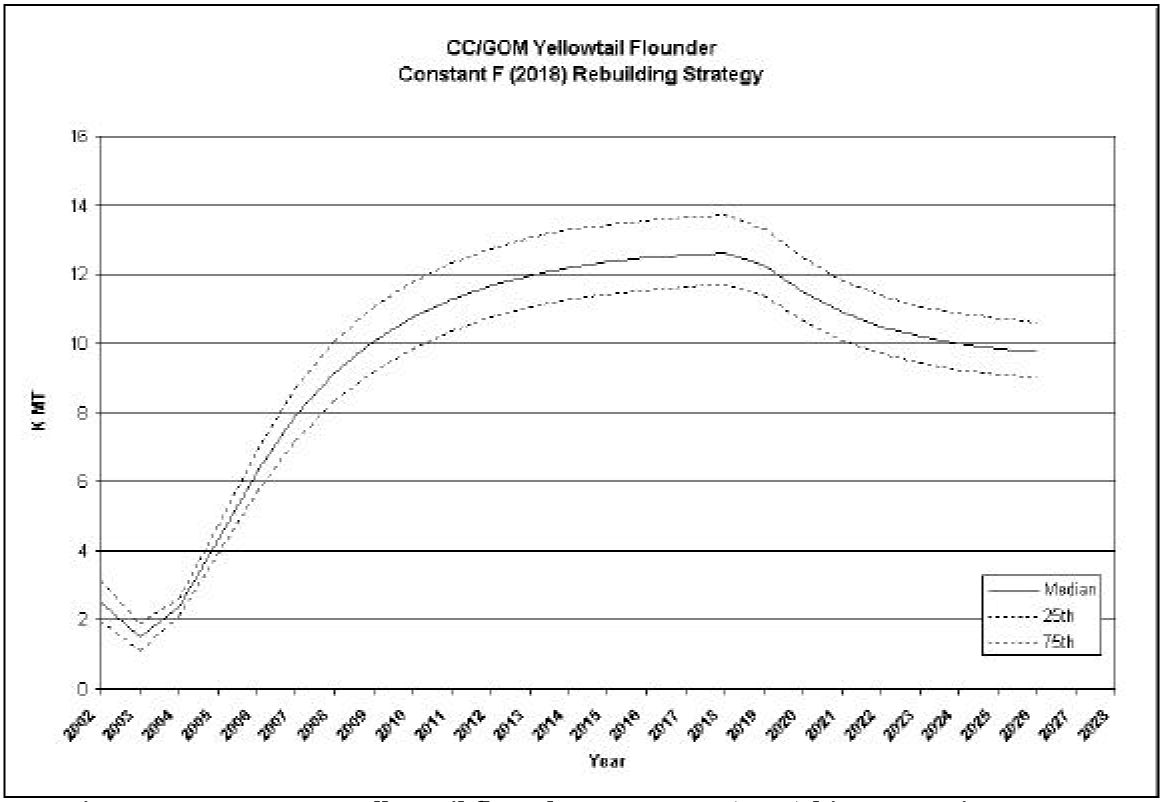


Figure 73 – CC/GOM yellowtail flounder constant F (2014) biomass trajectory

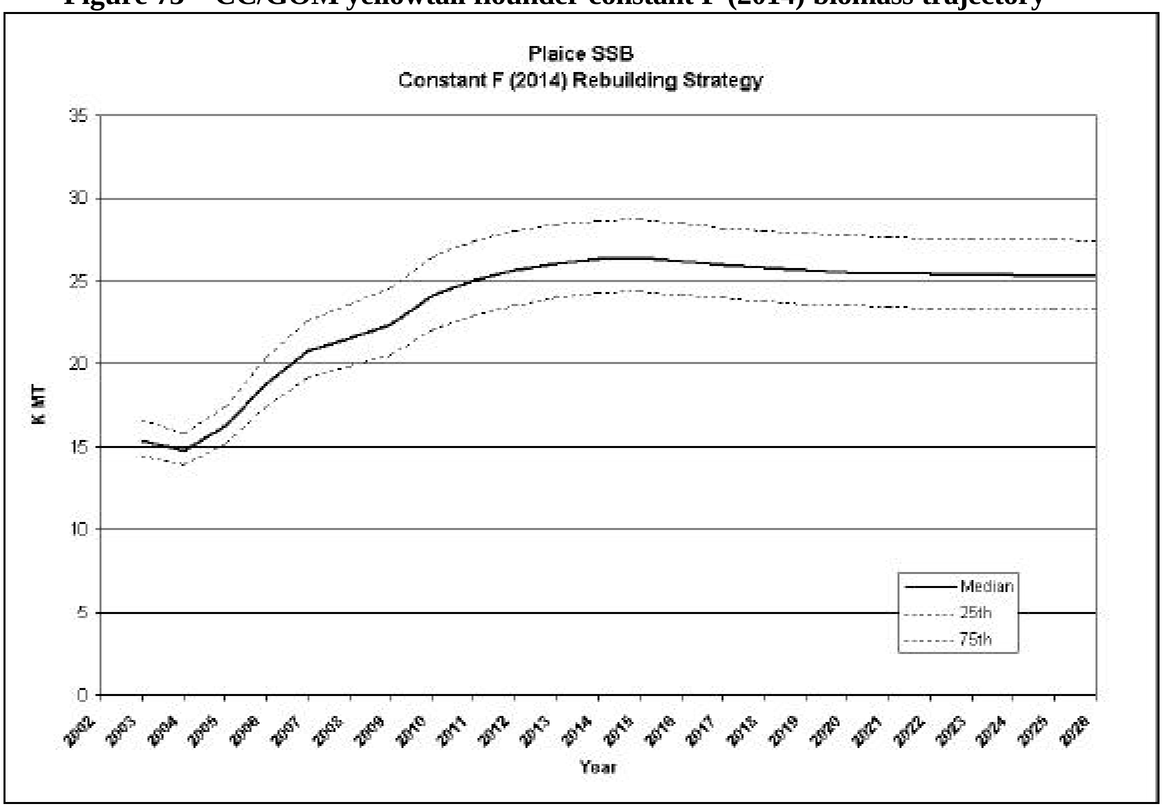


Figure 74 – Plaice constant F (2014) biomass trajectory

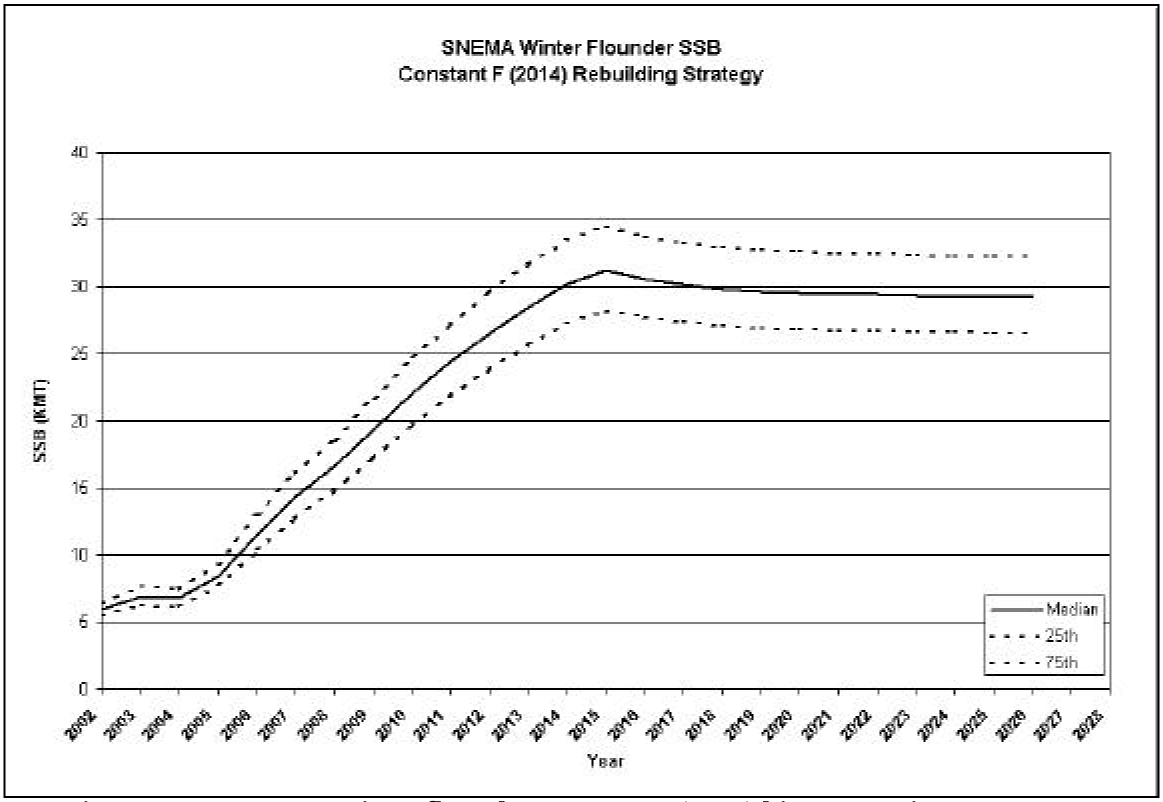


Figure 75 – SNE/MA winter flounder constant F (2014) biomass trajectory

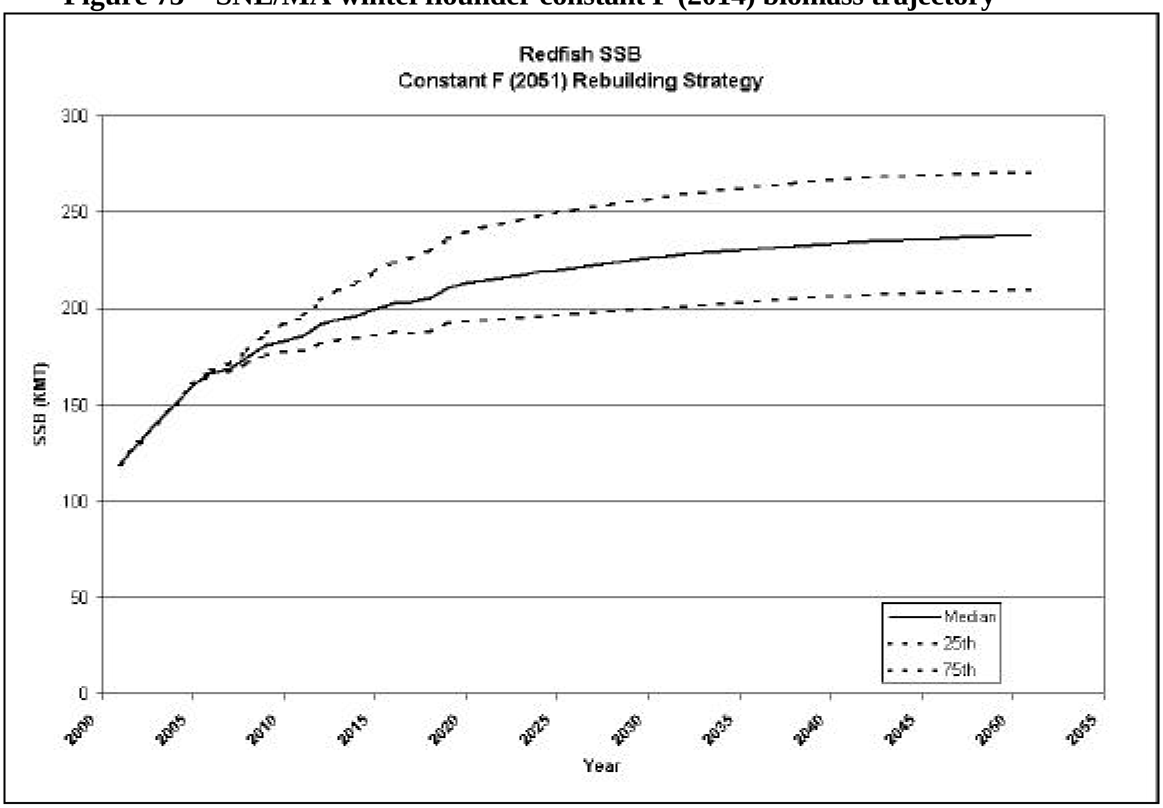


Figure 76 – Redfish constant F (2014) biomass trajectory

Year	Gulf of Maine Haddock	White Hake (all sizes)	White Hake (60+ cm)	Southern Windowpane	Ocean Pout
2002	15.86	6.70	2.47	0.25	2.46
2003	16.39	7.14	2.91	0.31	2.66
2004	16.91	7.58	3.34	0.36	2.87
2005	17.44	8.03	3.78	0.42	3.07
2006	17.96	8.47	4.21	0.47	3.27
2007	18.49	8.91	4.65	0.53	3.48
2008	19.02	9.35	5.09	0.59	3.68
2009	19.54	9.79	5.52	0.64	3.88
2010	20.07	10.23	5.96	0.70	4.09
2011	20.59	10.68	6.39	0.75	4.29
2012	21.12	11.12	6.83	0.81	4.49
2013	21.64	11.56	7.26	0.86	4.70
2014	22.17	12.00	7.70	0.92	4.90

Table 37 - Amendment 13 Projected Biomass Indices (kg/tow) for Survey Index-Based Groundfish Stocks under a constant mortality 2014 Rebuilding Scenario

5.2.1.6 Phased Fishing Mortality Reduction (2014)

Biomass targets for most stocks requiring formal rebuilding programs are achieved by 2014 under this option. The exceptions are GB cod, redfish, and CC/GOM yellowtail flounder.

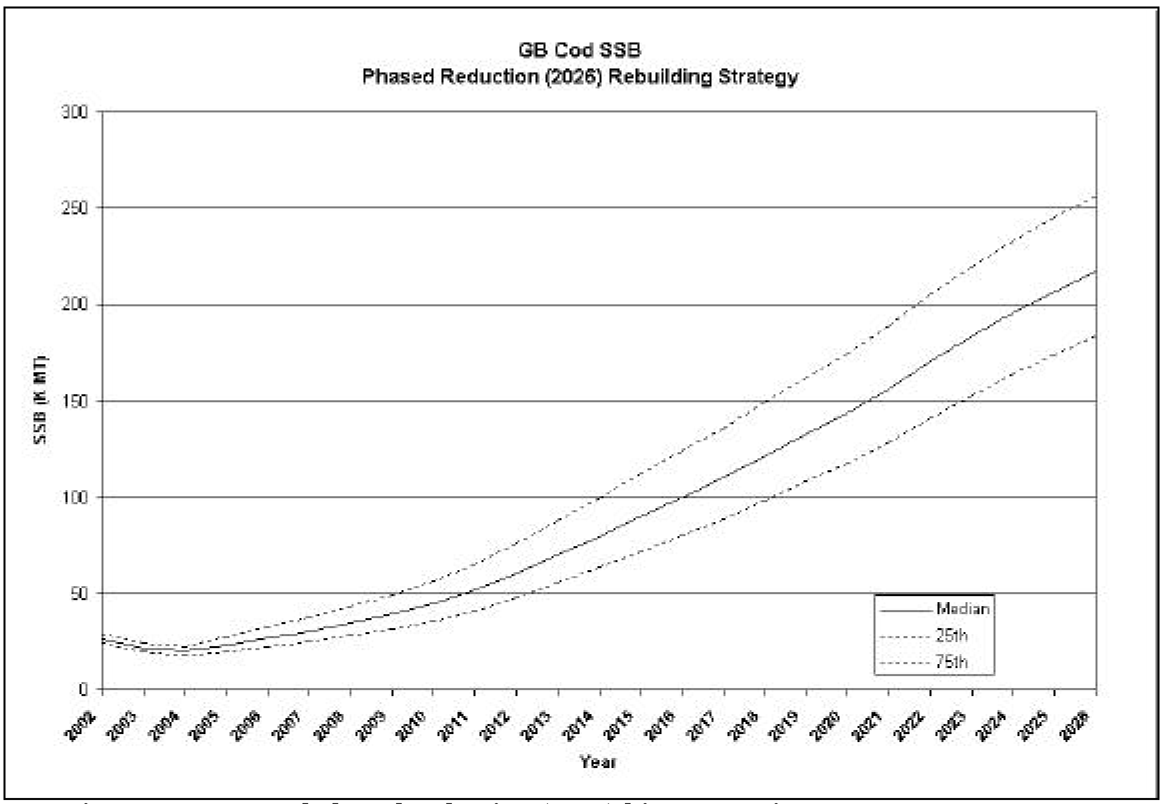


Figure 77 – GB cod phased reduction (2014) biomass trajectory

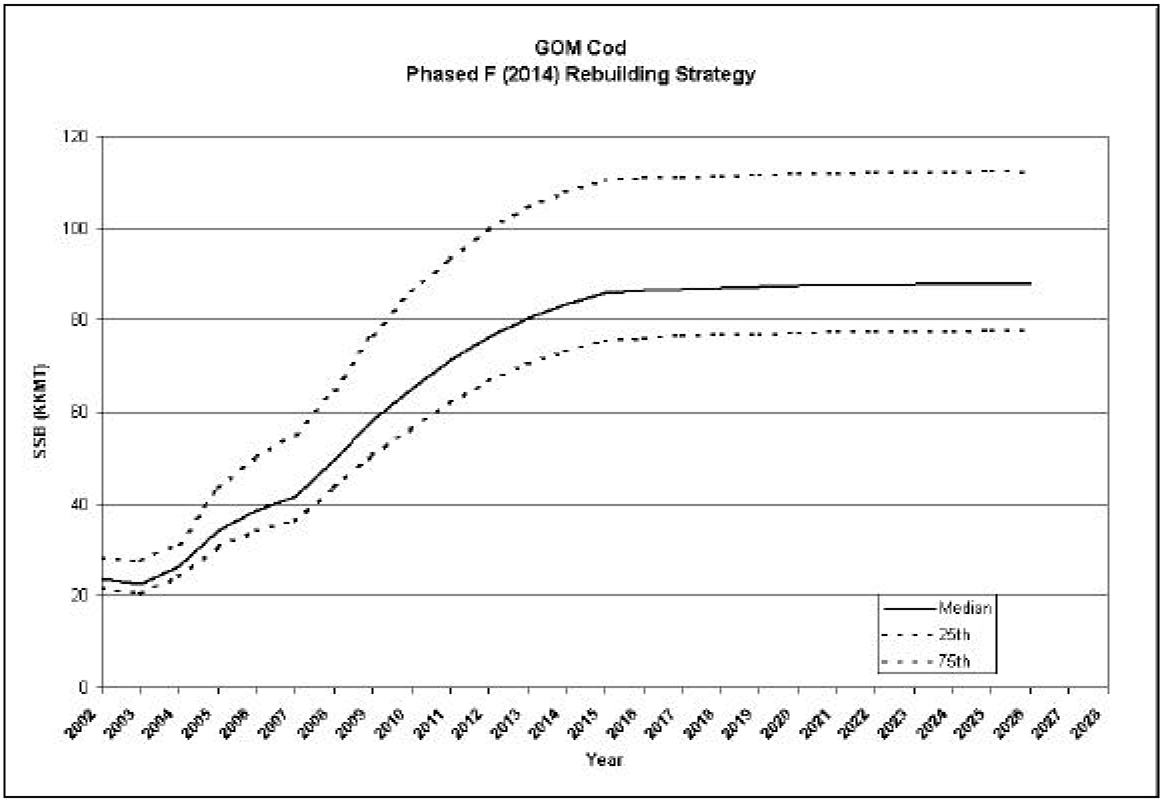


Figure 78 – GOM cod phased reduction (2014) biomass trajectory

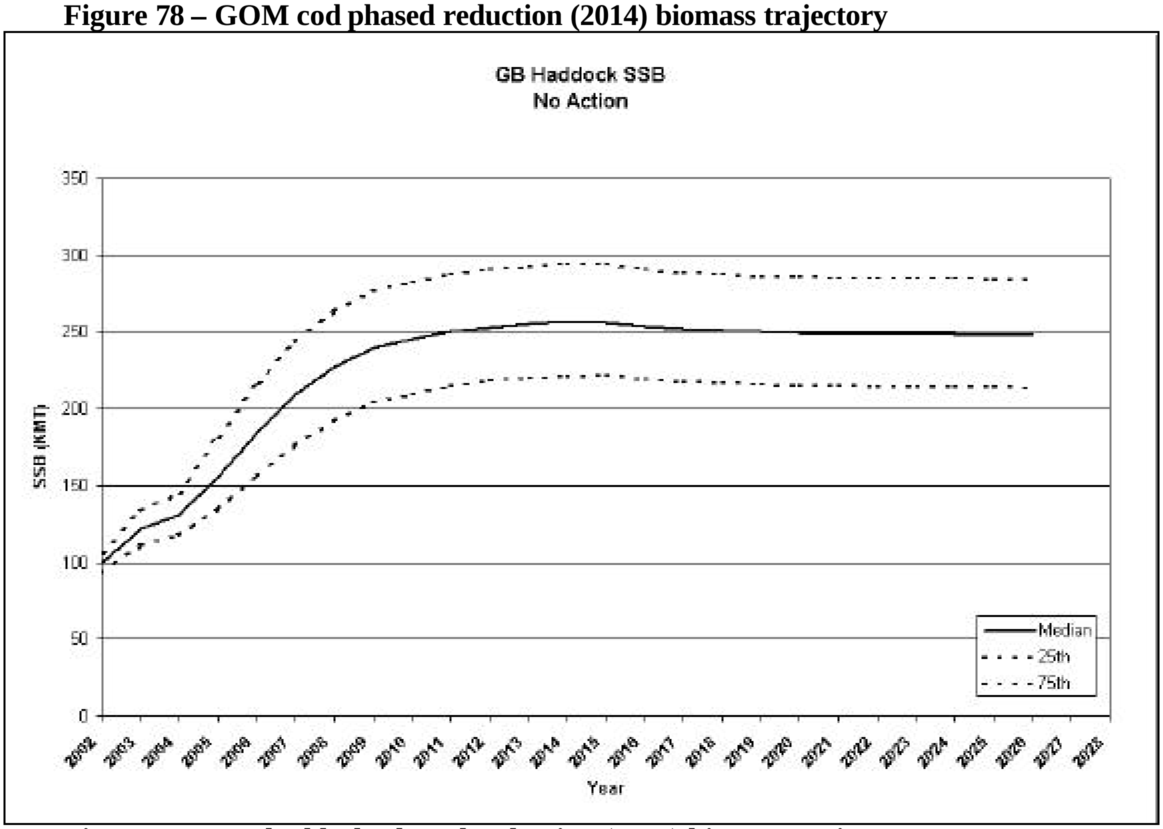


Figure 79 – GB haddock phased reduction (2014) biomass trajectory

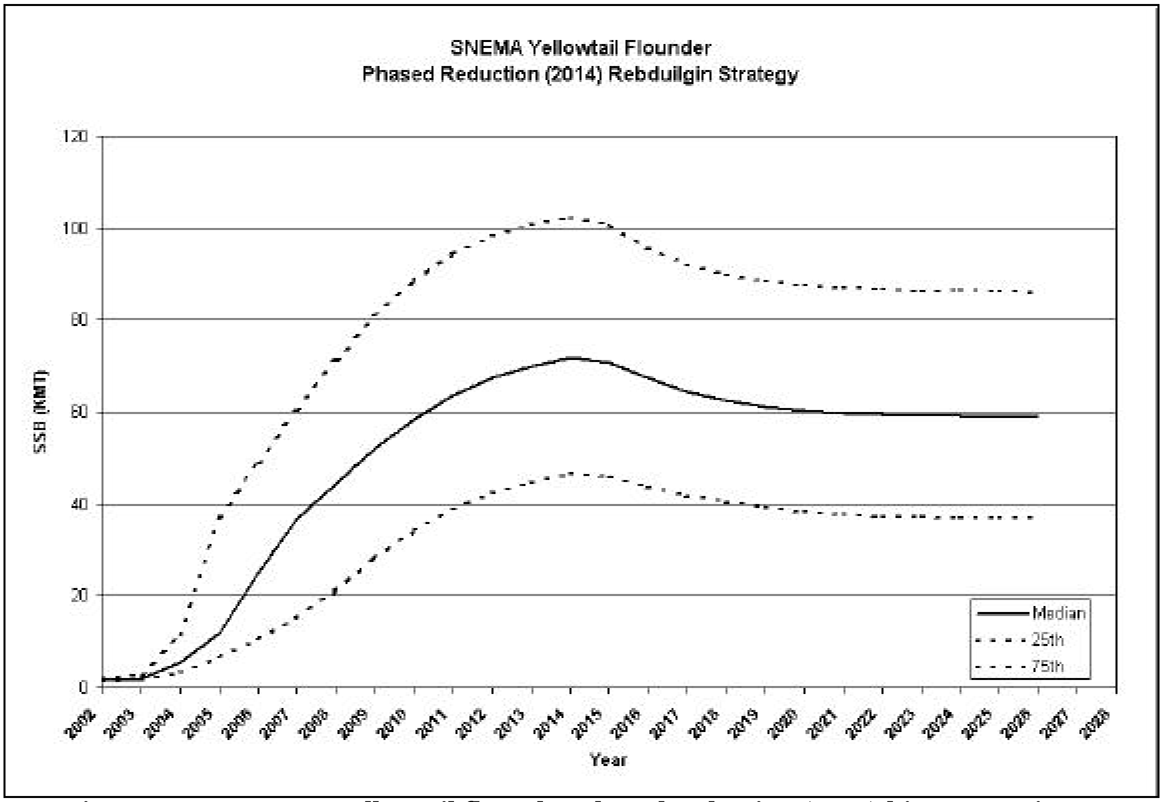


Figure 80 – SNE/MA yellowtail flounder phased reduction (2014) biomass trajectory

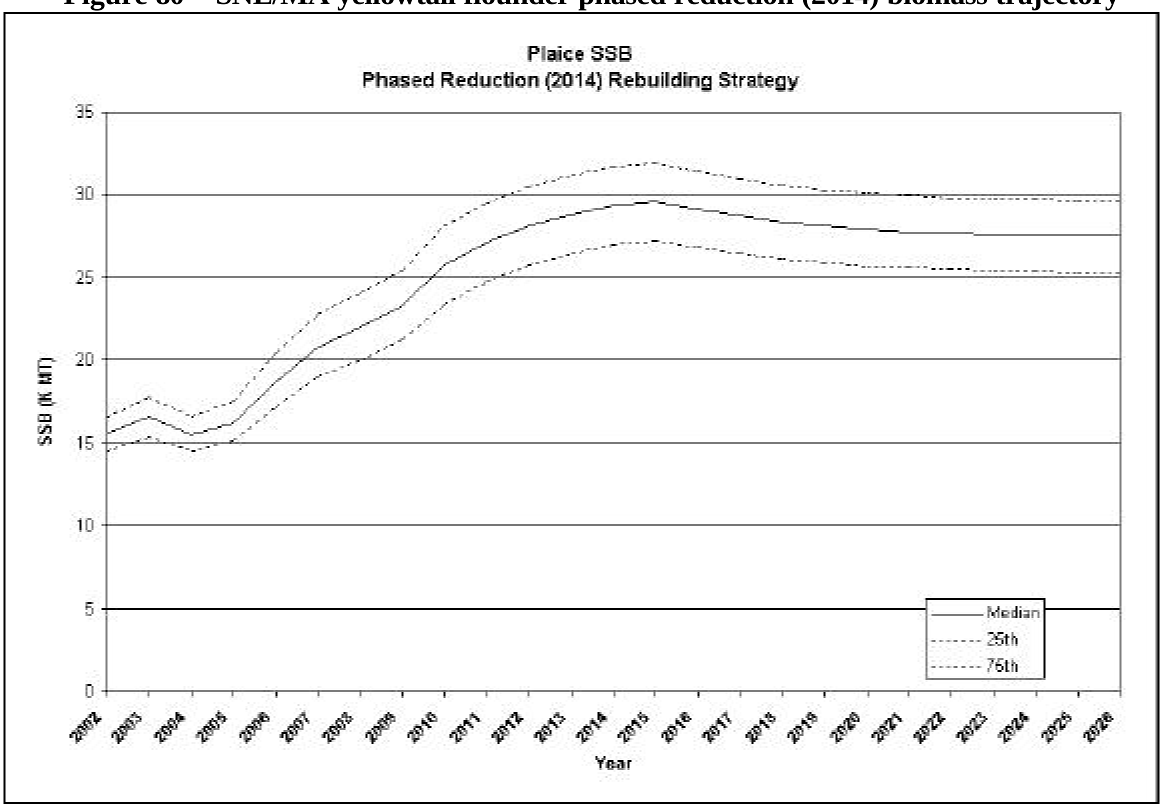


Figure 81 – Plaice phased reduction (2014) biomass trajectory

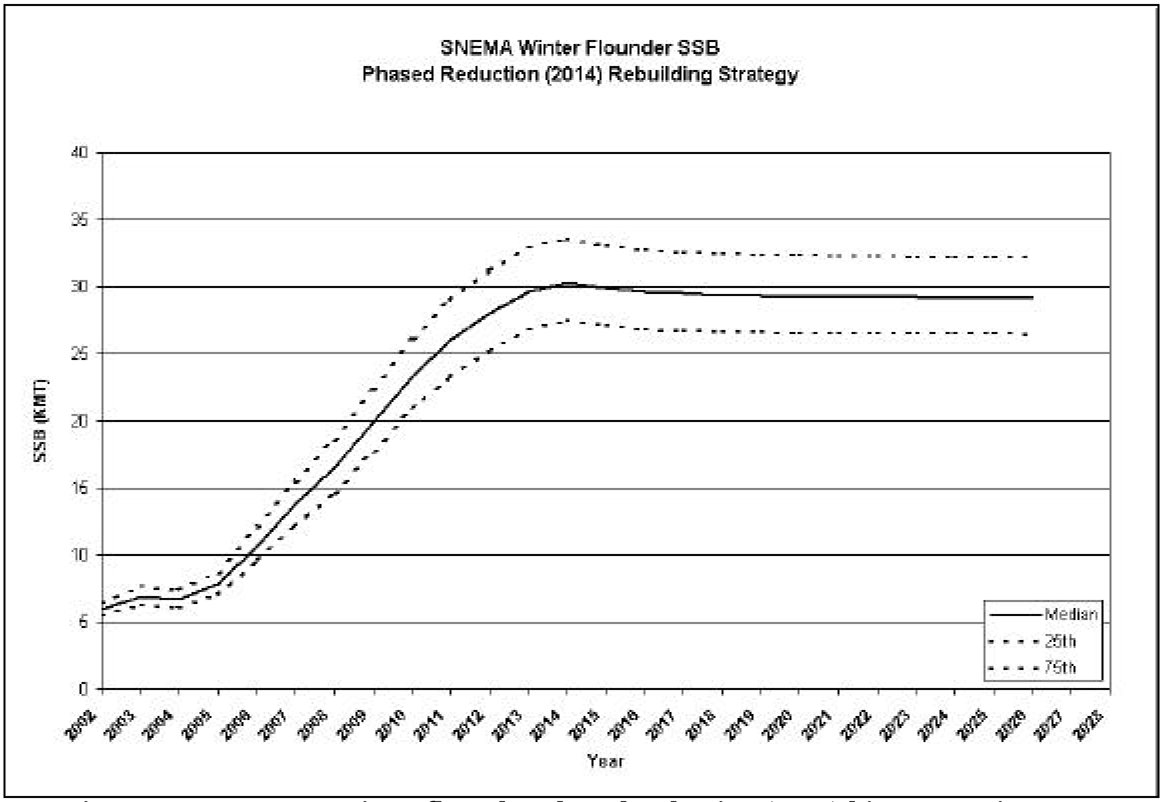


Figure 82 – SNE/MA winter flounder phased reduction (2014) biomass trajectory

5.2.1.7 Adaptive Rebuilding Strategy

For most stocks that require a formal rebuilding program, this alternative will achieve biomass targets by 2014. The exceptions are GB cod, CC/GOM yellowtail flounder, and redfish.

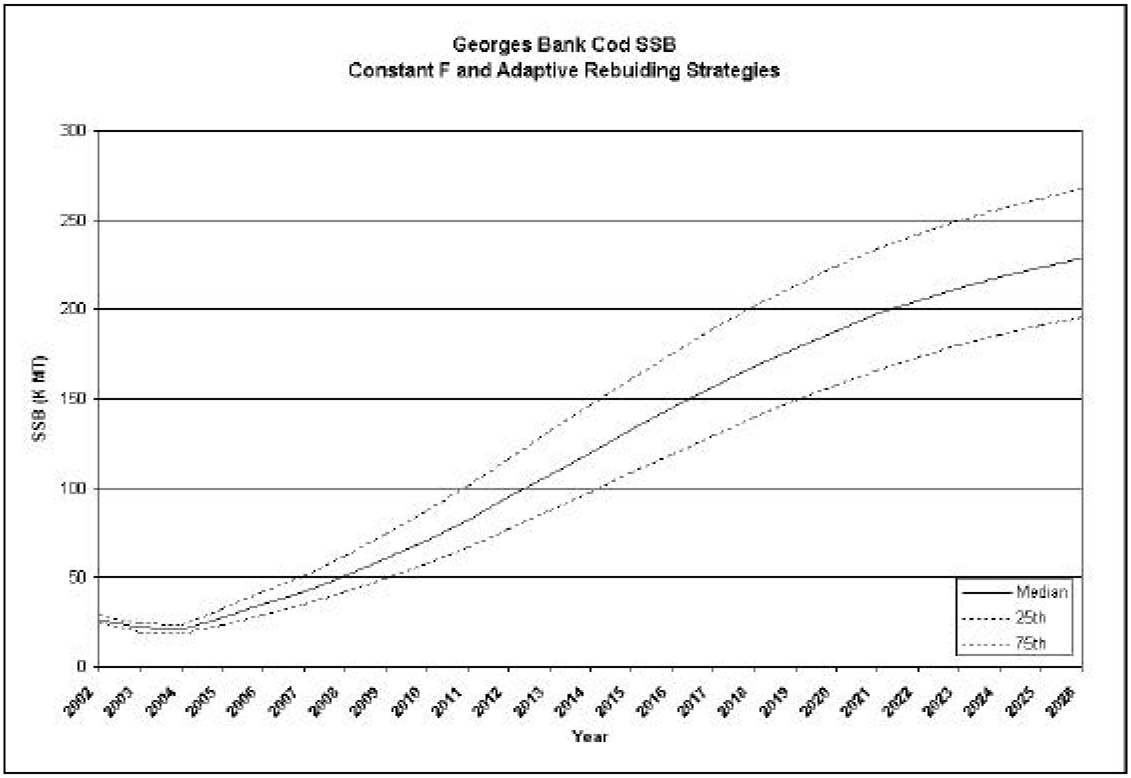


Figure 83 – GB Cod adaptive rebuilding strategy biomass trajectory

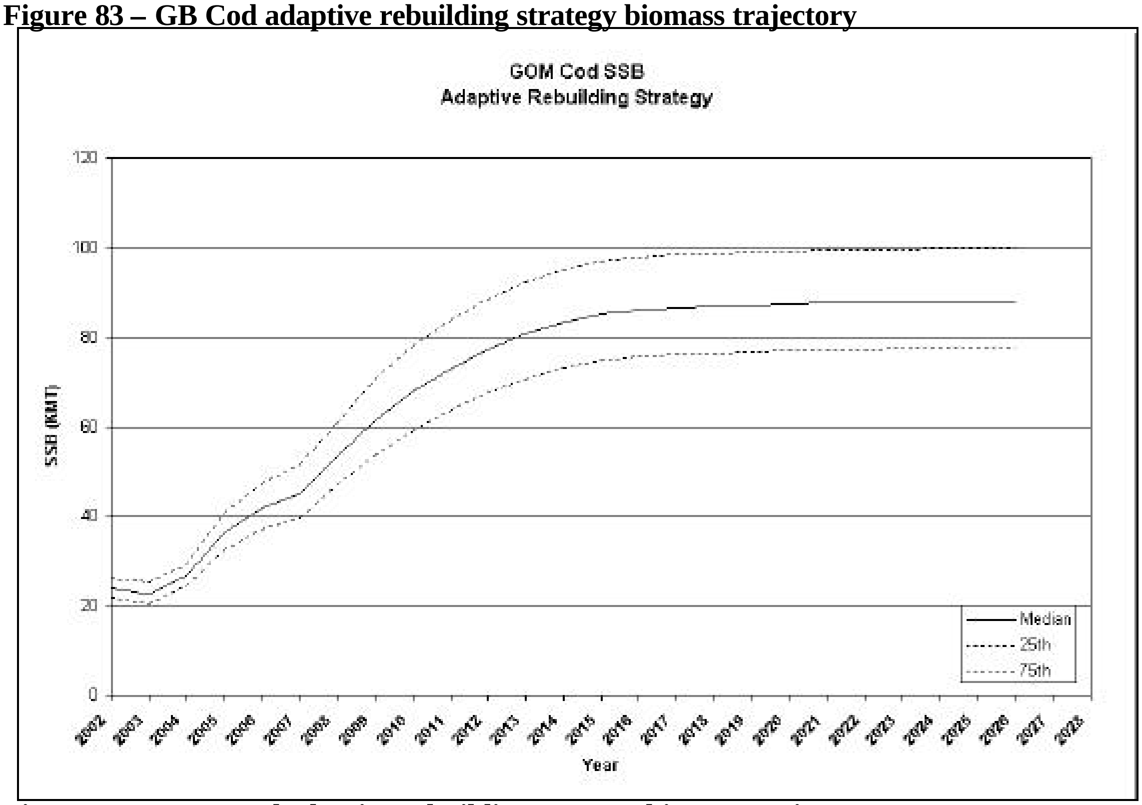


Figure 84 – GOM cod adaptive rebuilding strategy biomass trajectory

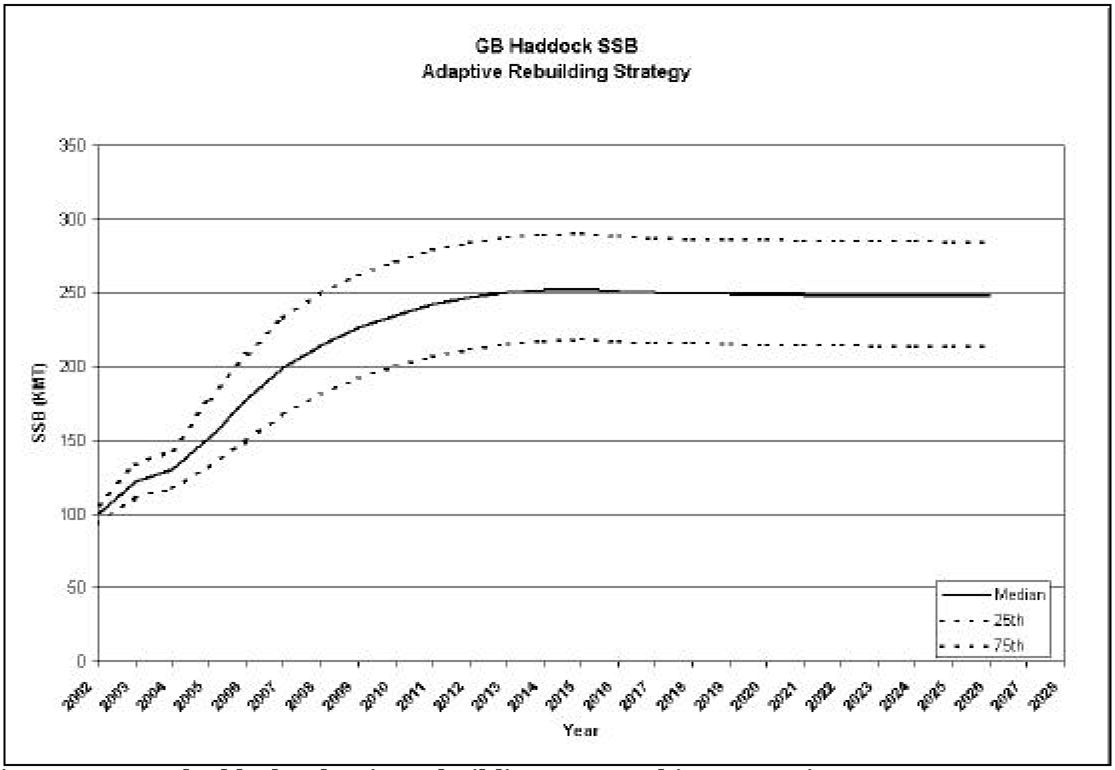


Figure 85 – GB haddock adaptive rebuilding strategy biomass trajectory

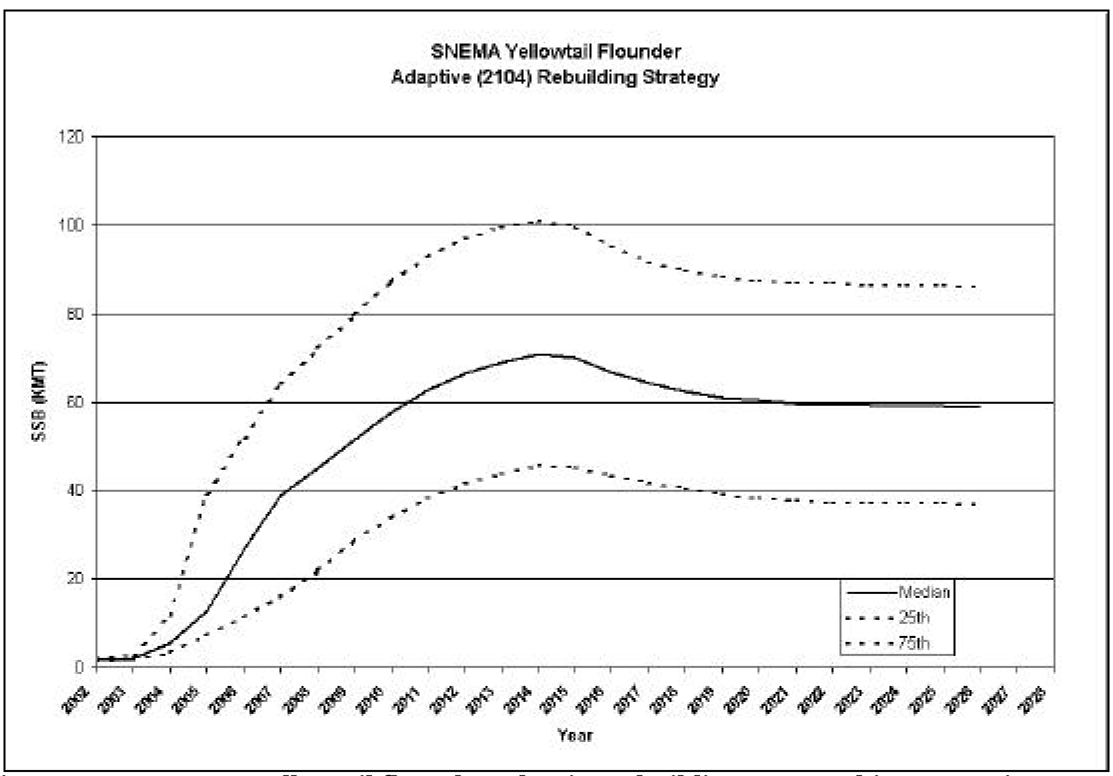


Figure 86 – SNE/MA yellowtail flounder adaptive rebuilding strategy biomass trajectory

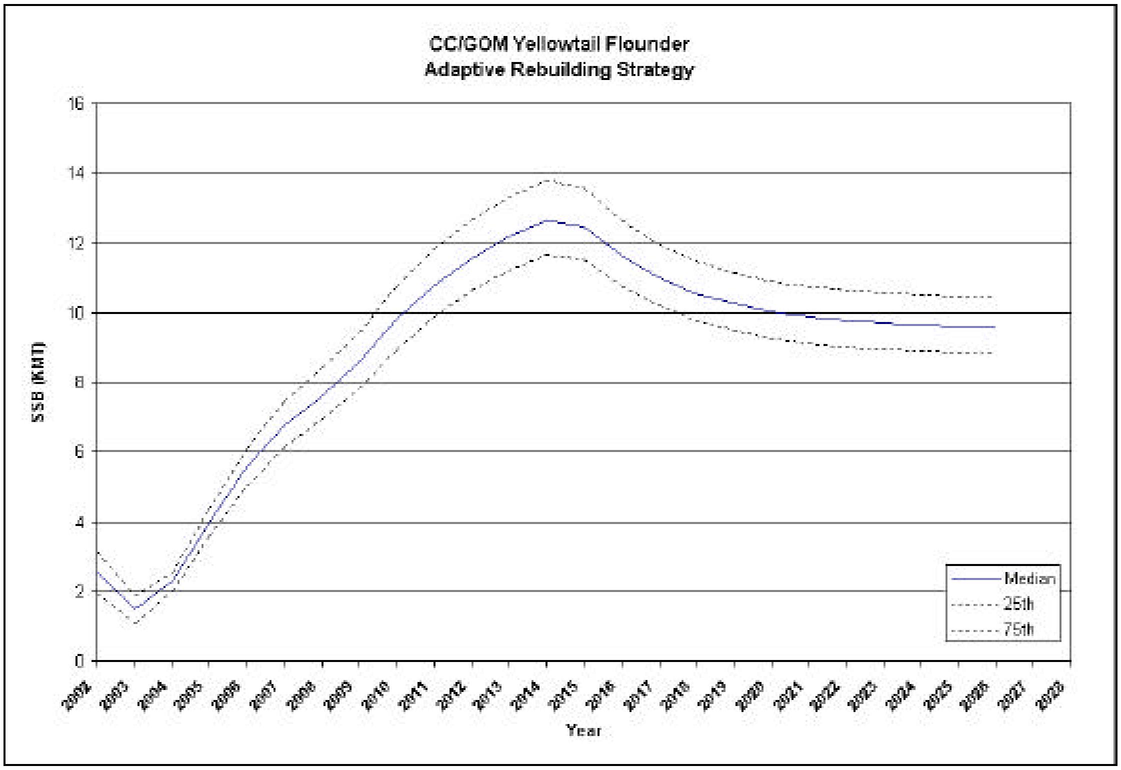


Figure 87 – CC/GOM yellowtail flounder adaptive rebuilding strategy biomass trajectory

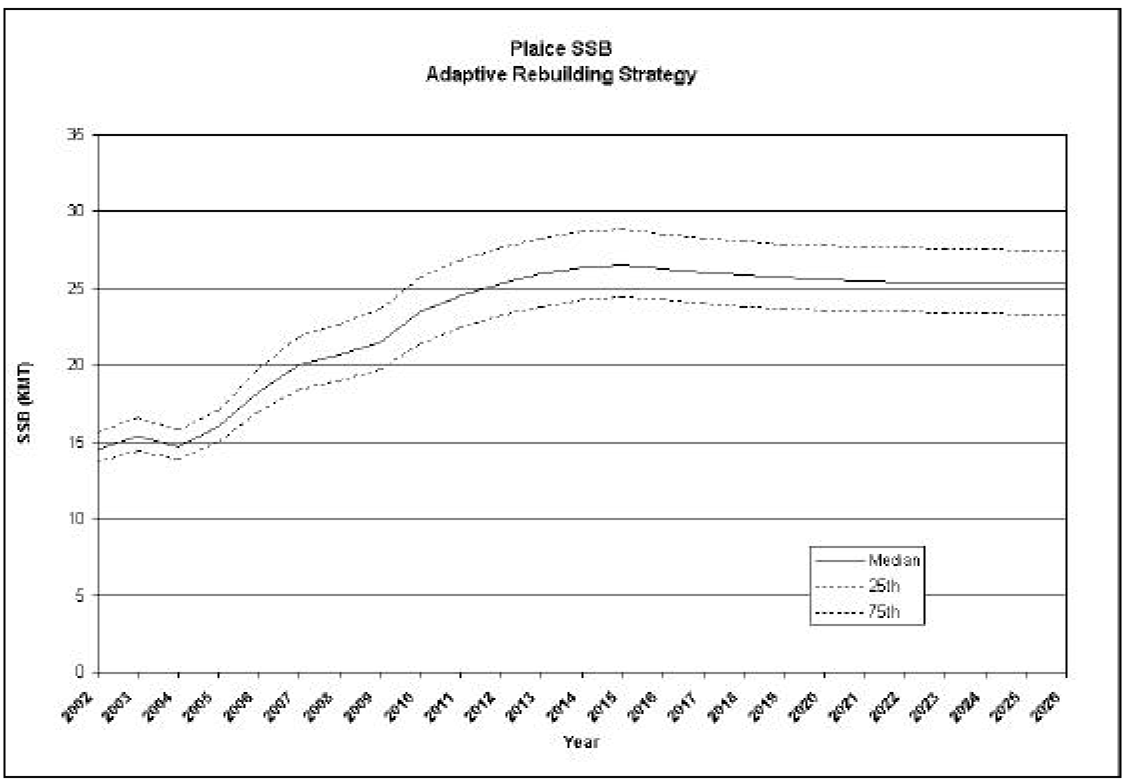


Figure 88 – Plaice adaptive rebuilding strategy biomass trajectory

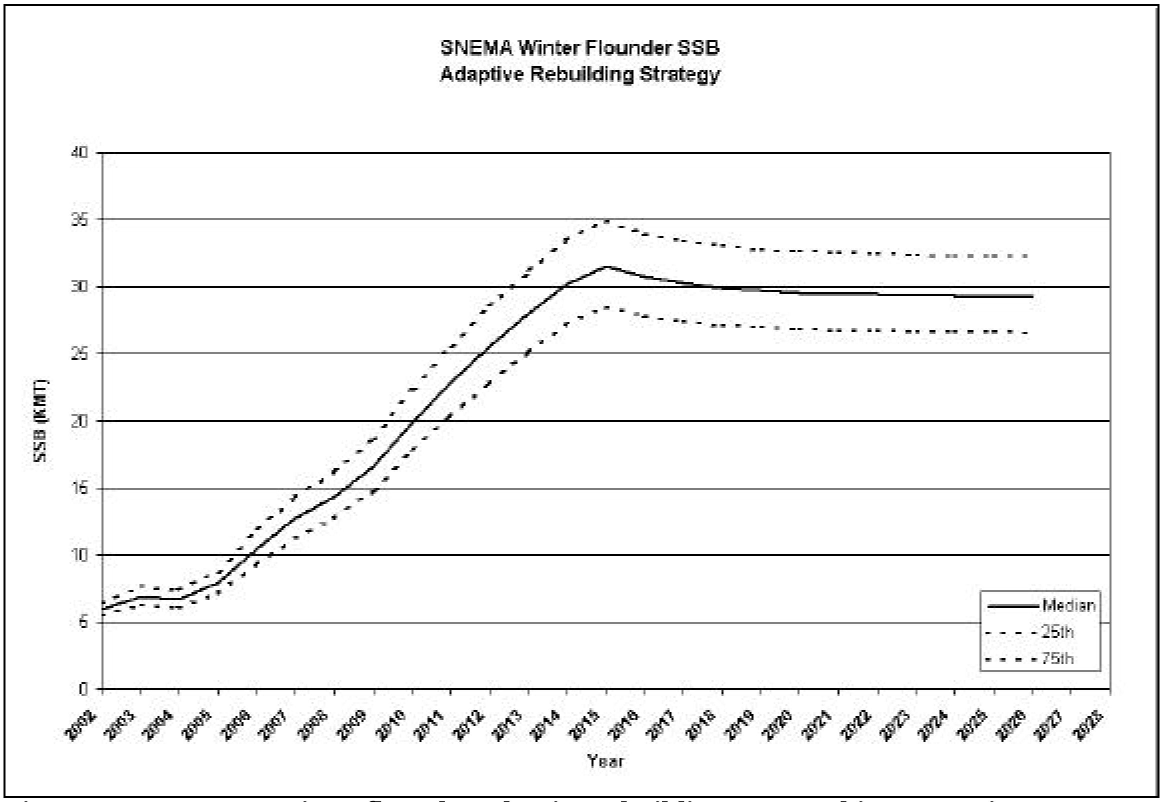


Figure 89 – SNE/MA winter flounder adaptive rebuilding strategy biomass trajectory

5.2.1.8 Comparison of Rebuilding Strategies

Three broad rebuilding strategies (constant fishing mortality, phased reduction fishing mortality, and adaptive) and two different ending dates for rebuilding (2009 or 2014 for most stocks) were considered. The proposed action combines the adaptive and phased strategies. All of the strategies are designed to achieve the target biomass within the rebuilding period with a median (50 percent) probability. For this reason, there is no difference in the final results of the strategies. The projected rate of growth of the stock biomass (or spawning stock biomass) differs, however, and the uncertainty surrounding the projected biomass trajectories may also differ. For most stocks, spawning stock biomass increases most rapidly with the constant fishing mortality rate option and least rapidly with the phased reduction strategy. One measure of the uncertainty of the projected biomass is the inter-quartile range around each predicted biomass (that is, the range between the 25th and 75th percentile, expressed as a percent of the median SSB). The median biomass trajectories are compared in

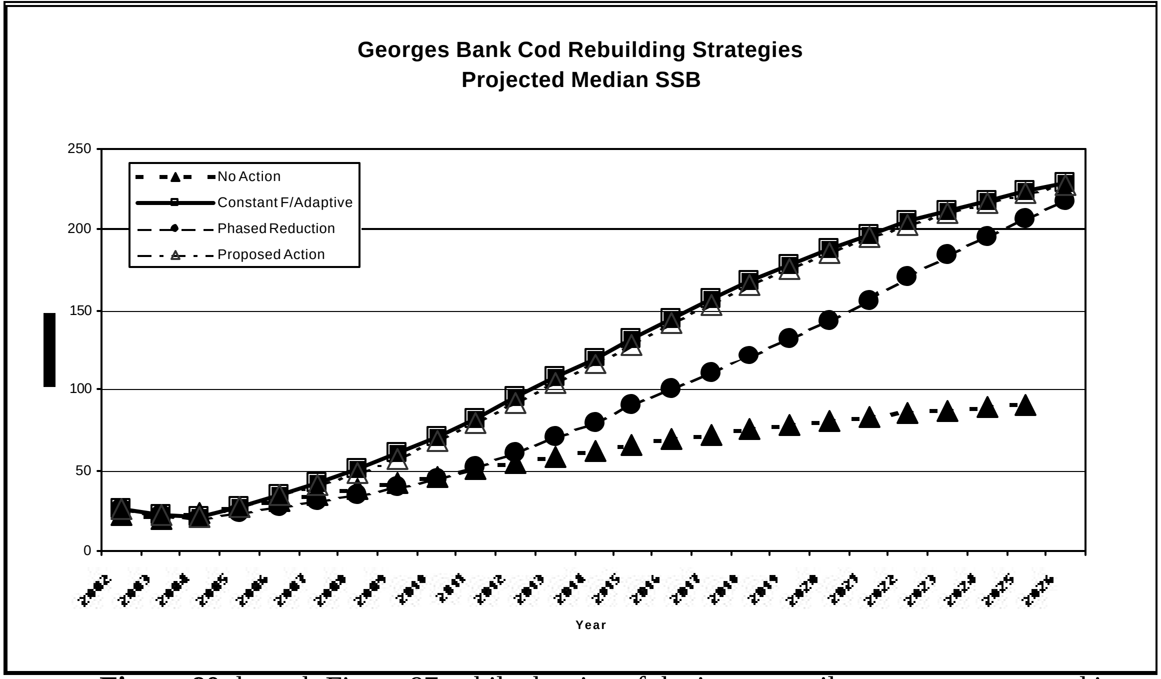


Figure 90 through Figure 97, while the size of the inter-quartile range are compared in Figure 98 and Figure 105. The following discussion summarizes this information for each stock.

<u>Georges Bank cod</u>: The constant F and adaptive approach are the same and rebuild the stock the most quickly. The phased reduction approach allows a slight increase in mortality over no action in the early years of the program, and as a result the biomass trajectory does not exceed the no action biomass until 2010. The inter-quartile range for the constant/adaptive strategies is less than for the phased strategy.

<u>Gulf of Maine cod</u>: The constant F alternatives rebuild most quickly (for both 2009 and 2014 end dates), but there are only slight differences in the projected biomass trajectory for any of the alternatives that have the same end date. Inter-quartile ranges follow a similar pattern: the constant F range is smaller than the phased F range for a given rebuilding period, but the differences are small.

Georges Bank haddock: All of the alternatives result in similar rebuilding trajectories, including the No Action alternative. The No Action alternative actually has a lower fishing mortality rate than some of the rebuilding strategies and will achieve the target more quickly. There are only minor differences in the inter-quartile range for all alternatives.

SNE/MA yellowtail flounder: For the 2009 end date, the phased reduction and constant F strategies result in nearly identical biomass trajectories. For the 2014 end date, the constant F strategy rebuilds more quickly, with the phased reduction and adaptive strategies nearly identical. All rebuilding alternatives have similar and smaller inter-quartile ranges than the no-action alternative.

CC/GOM yellowtail flounder: Constant F approaches rebuild more quickly. The phased approach and adaptive approach have similar biomass trajectories until 2010, when the adaptive approach lags behind the phased approach. With the exception of the no action alternative, the inter-quartile ranges of SSB are nearly identical.

Plaice: The constant F approach rebuilds more rapidly than the phased reduction or adaptive approach. The latter two result in similar biomass trajectories. The constant F and adaptive inter-quartile ranges are only slightly smaller than the phased reduction range.

SNE/MA winter flounder: The constant F and phased reduction result in nearly identical biomass trajectories. The inter-quartile range is nearly identical for all alternatives.

Redfish: The No Action and constant F strategies rebuild more quickly than the adaptive approach, which allows mortality to increase in the near term. There are only slight differences in the inter-quartile range for all strategies.

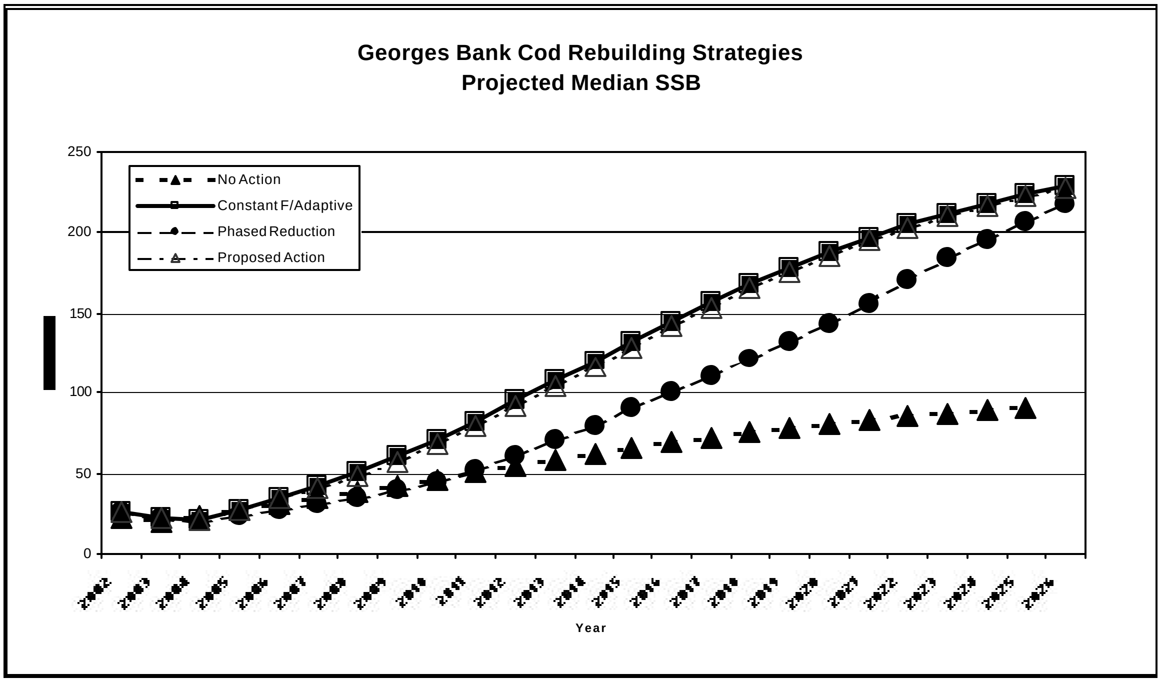


Figure 90 – Georges Bank cod rebuilding strategy comparison

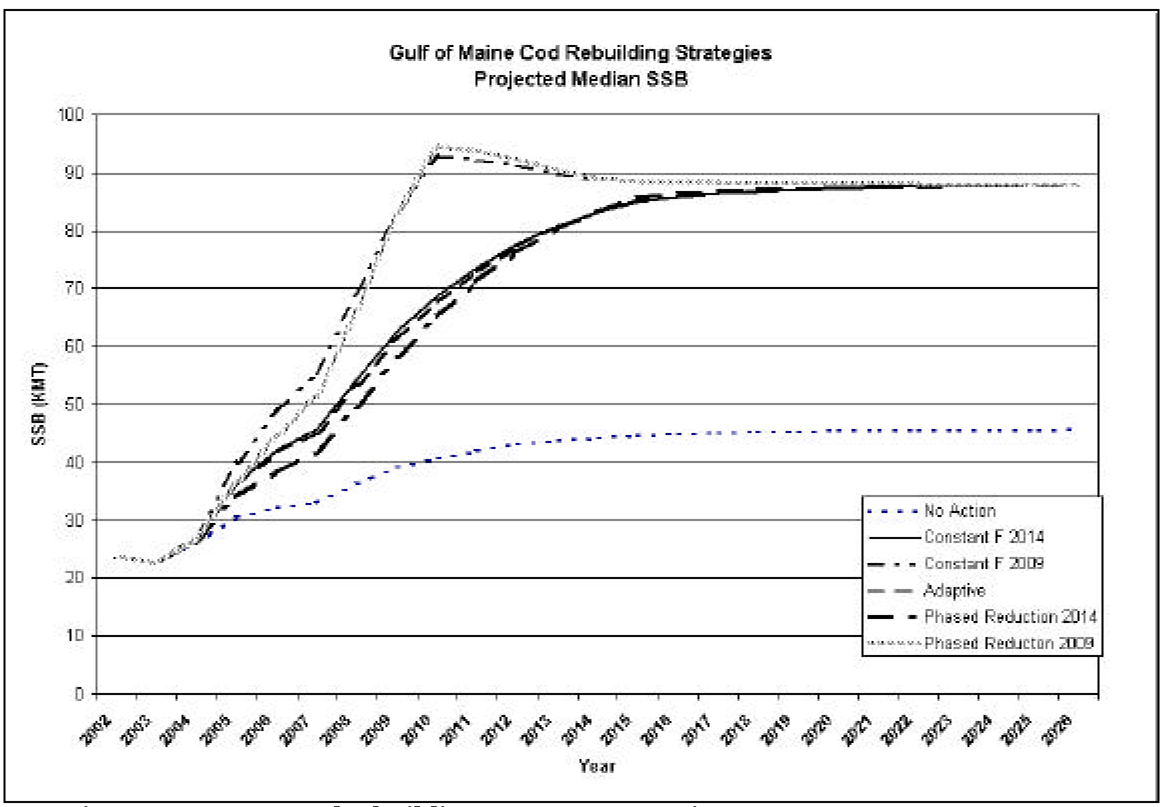


Figure 91 – GOM cod rebuilding strategy comparison

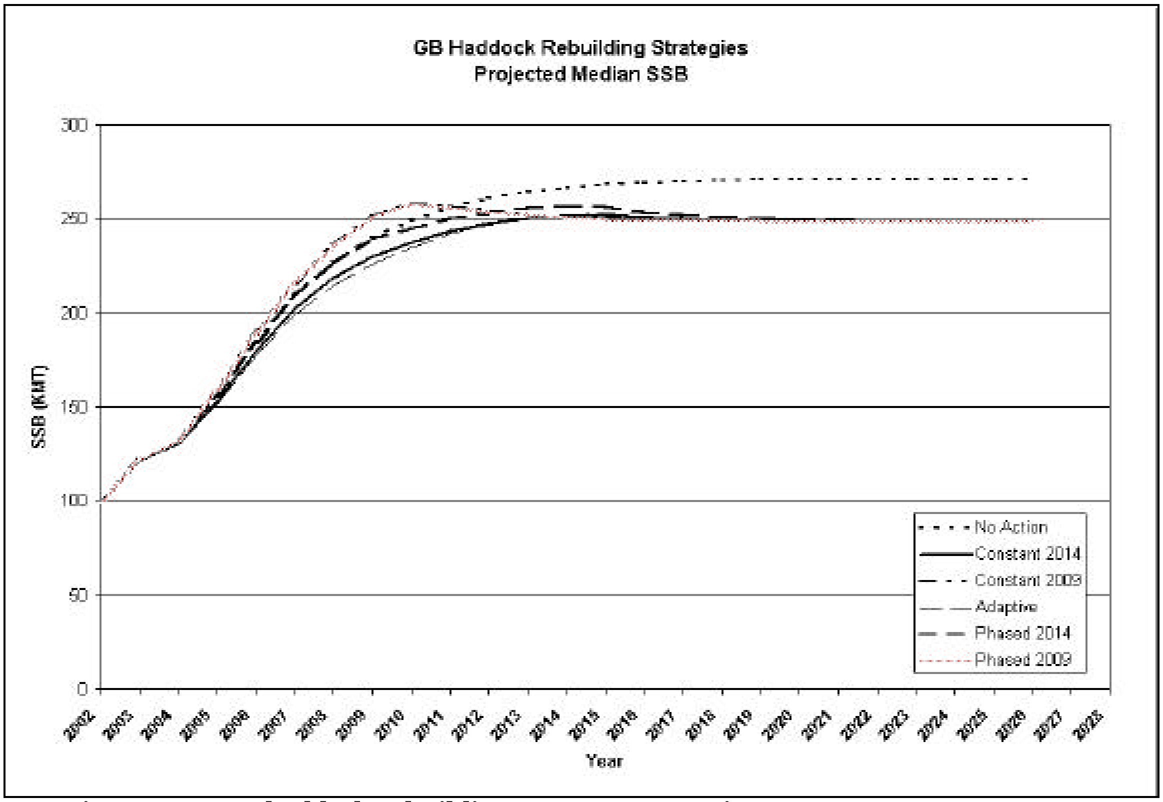


Figure 92 – GB haddock rebuilding strategy comparison

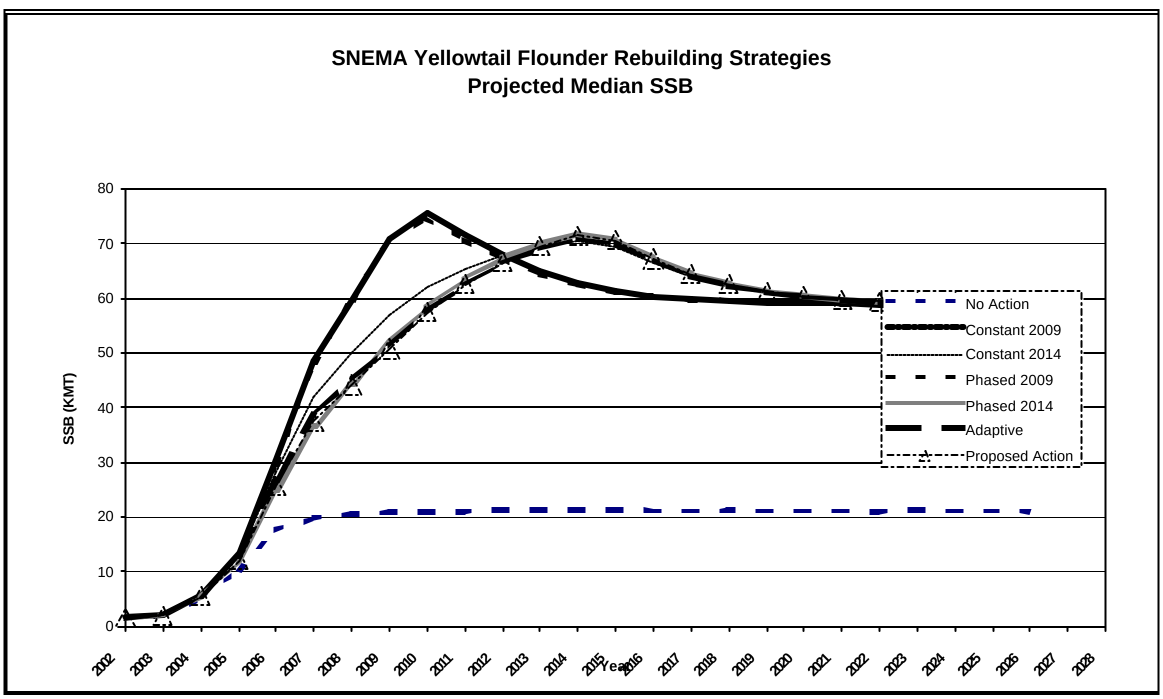


Figure 93 – SNE/MA yellowtail flounder rebuilding strategy comparison

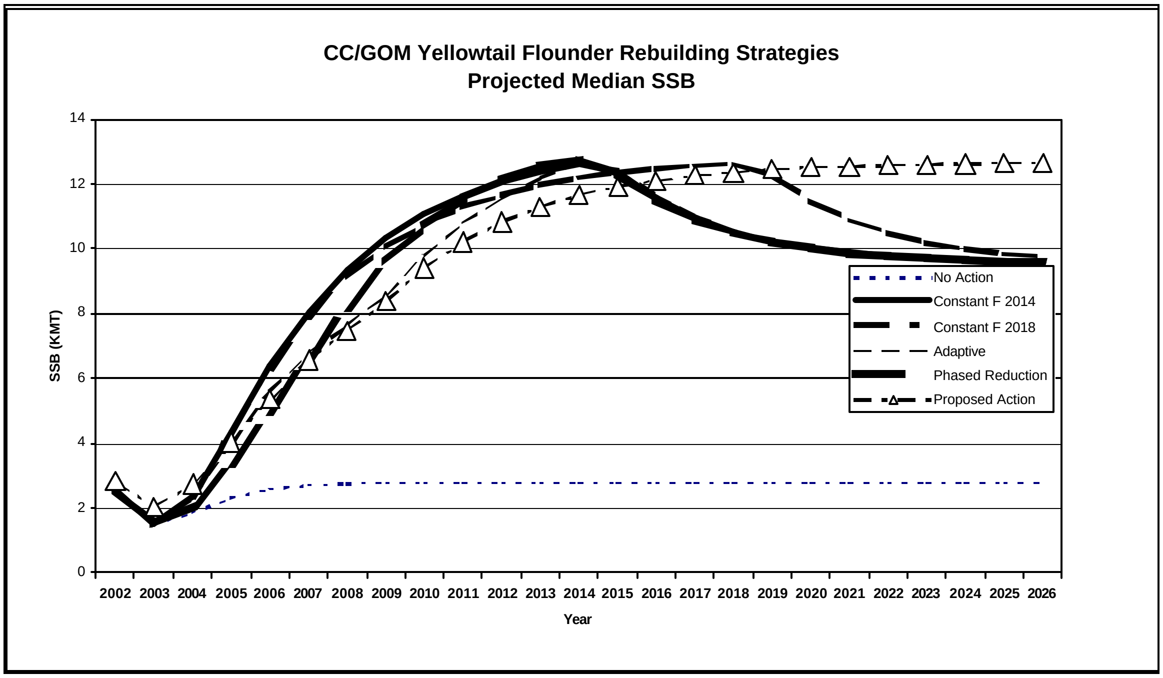


Figure 94 – CC/GOM yellowtail flounder rebuilding strategy comparison

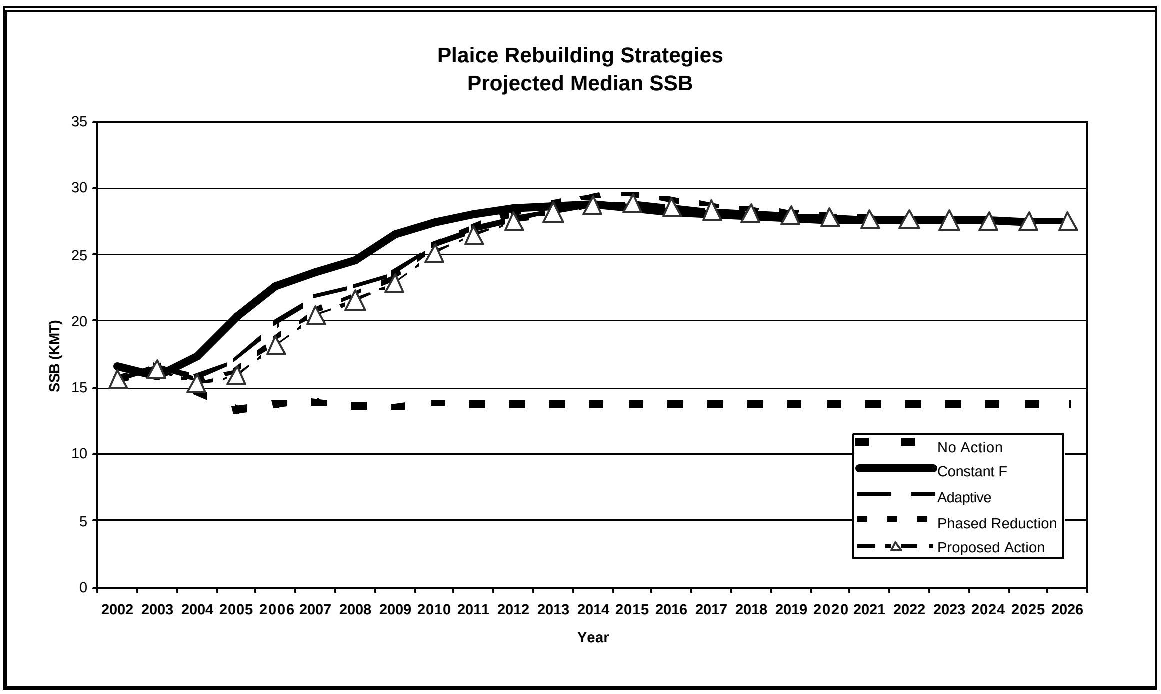


Figure 95 – Plaice rebuilding strategy comparison

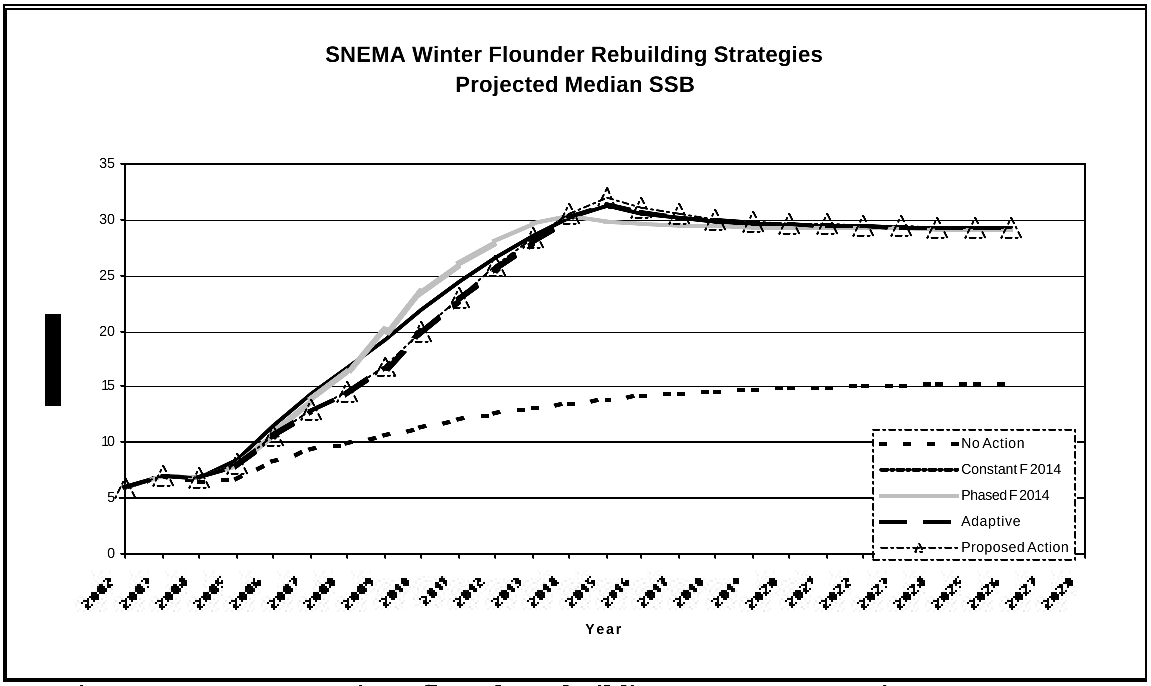


Figure 96 – SNE/MA winter flounder rebuilding strategy comparison

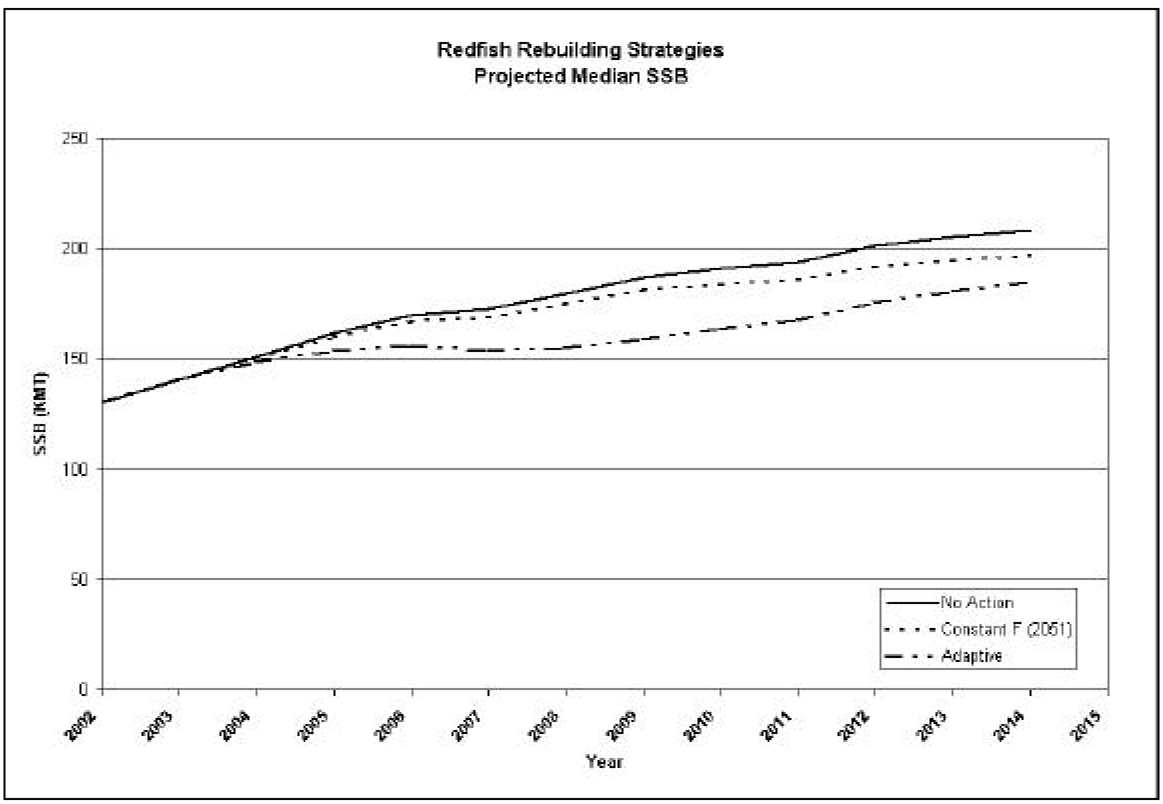


Figure 97 – Redfishrebuilding strategy comparison

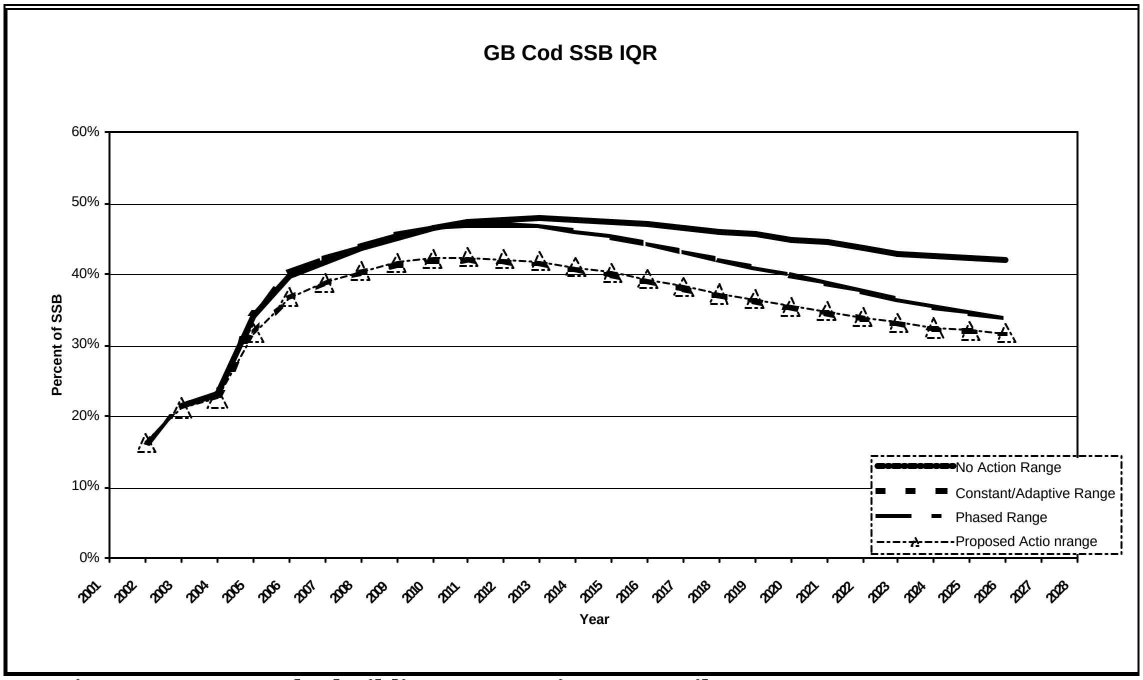


Figure 98 – GB cod rebuilding strategy inter-quartile ranges

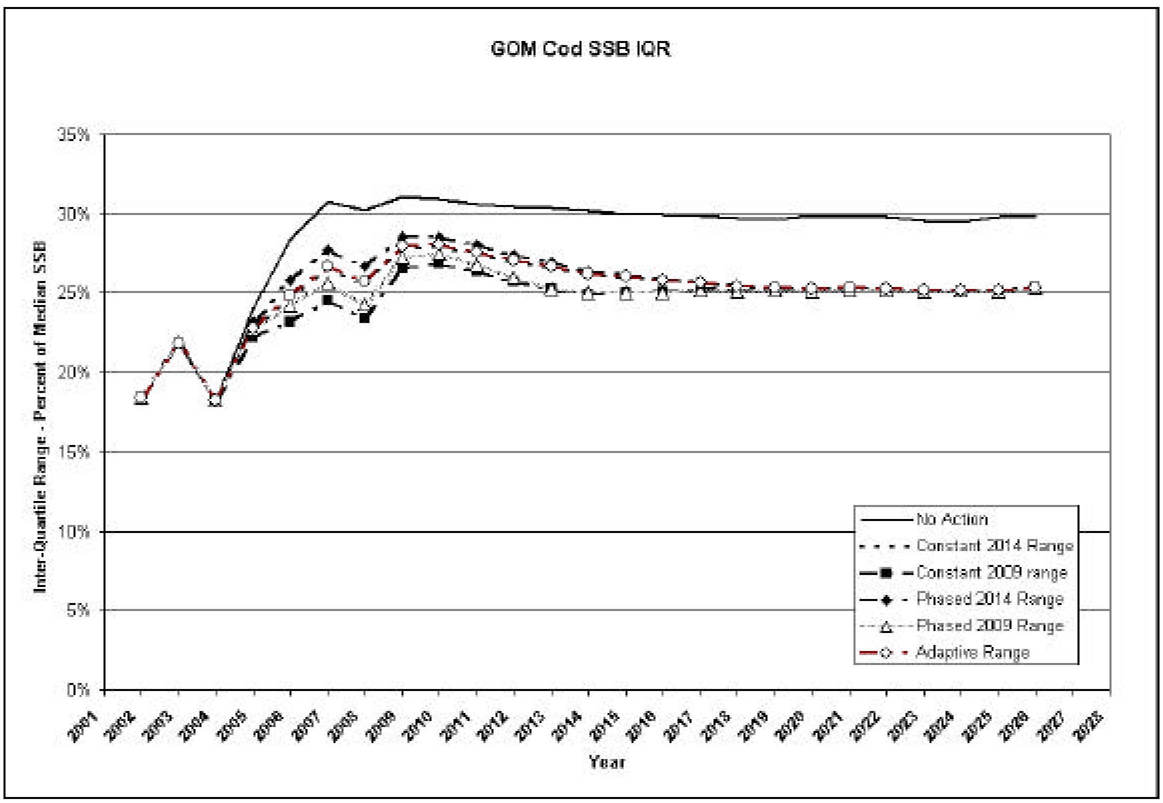


Figure 99 – GOM cod rebuilding strategy inter-quartile ranges

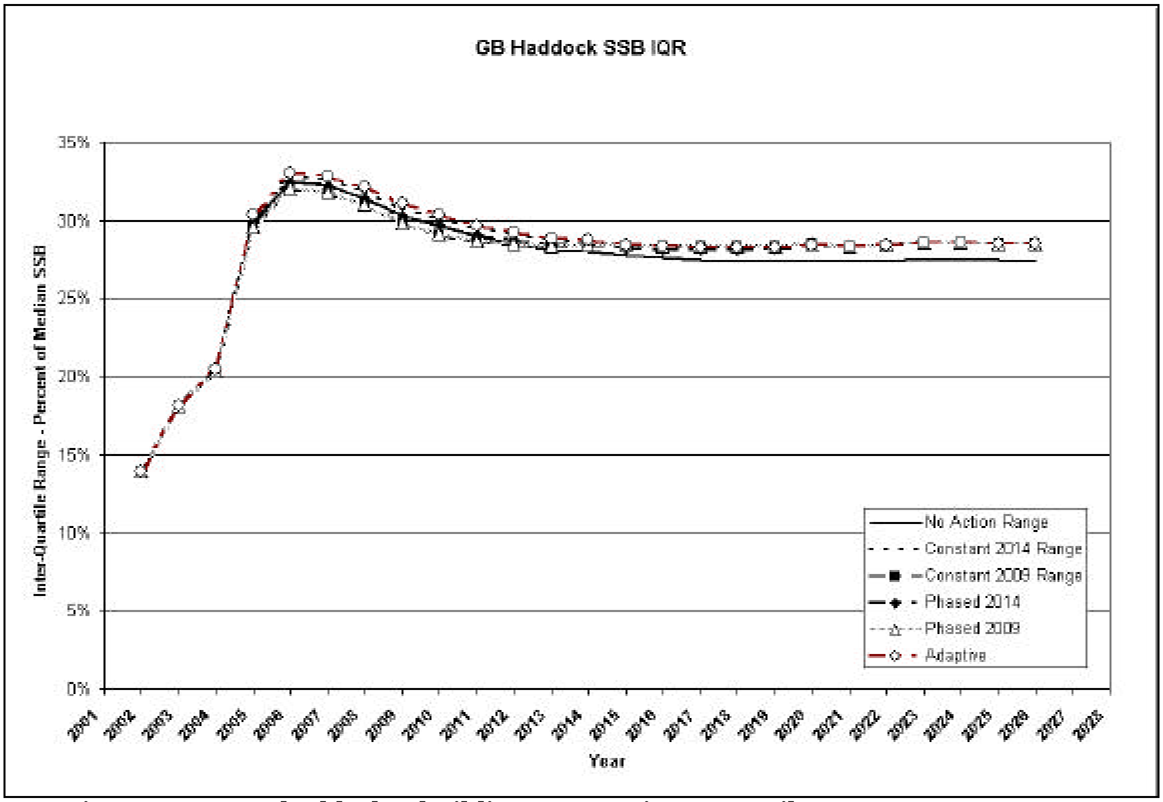


Figure 100 – GB haddock rebuilding strategy inter-quartile ranges

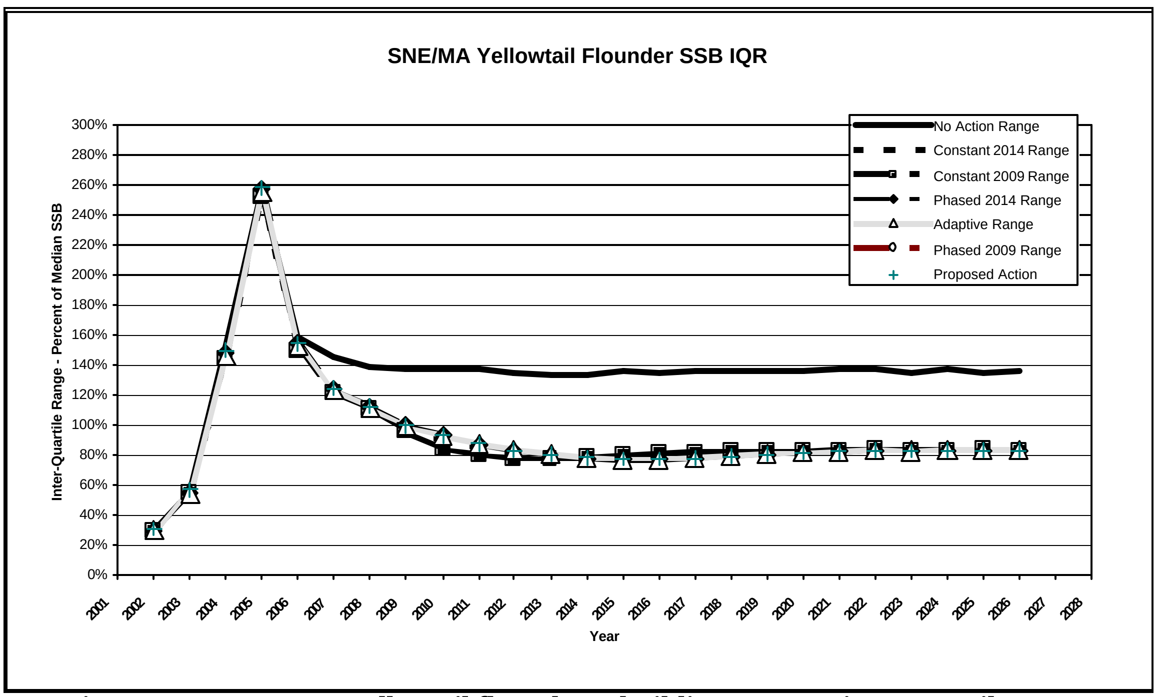


Figure 101 – SNE/MA yellowtail flounder rebuilding strategy inter-quartile ranges

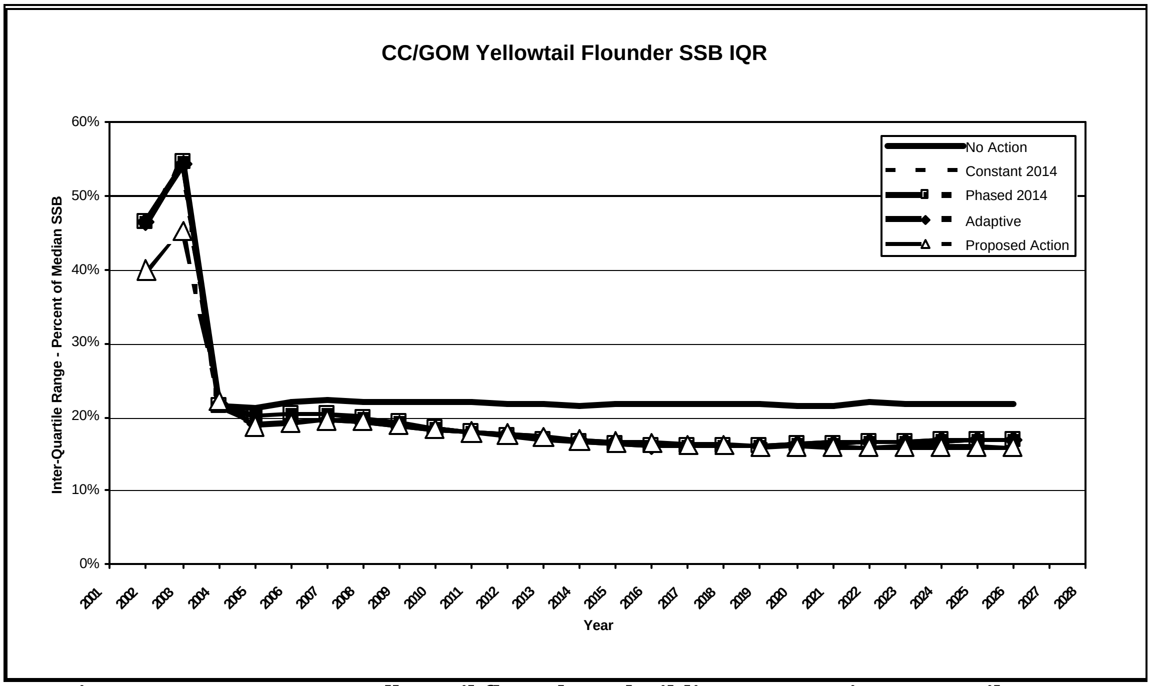


Figure 102 – CC/GOM yellowtail flounder rebuilding strategy inter-quartile ranges

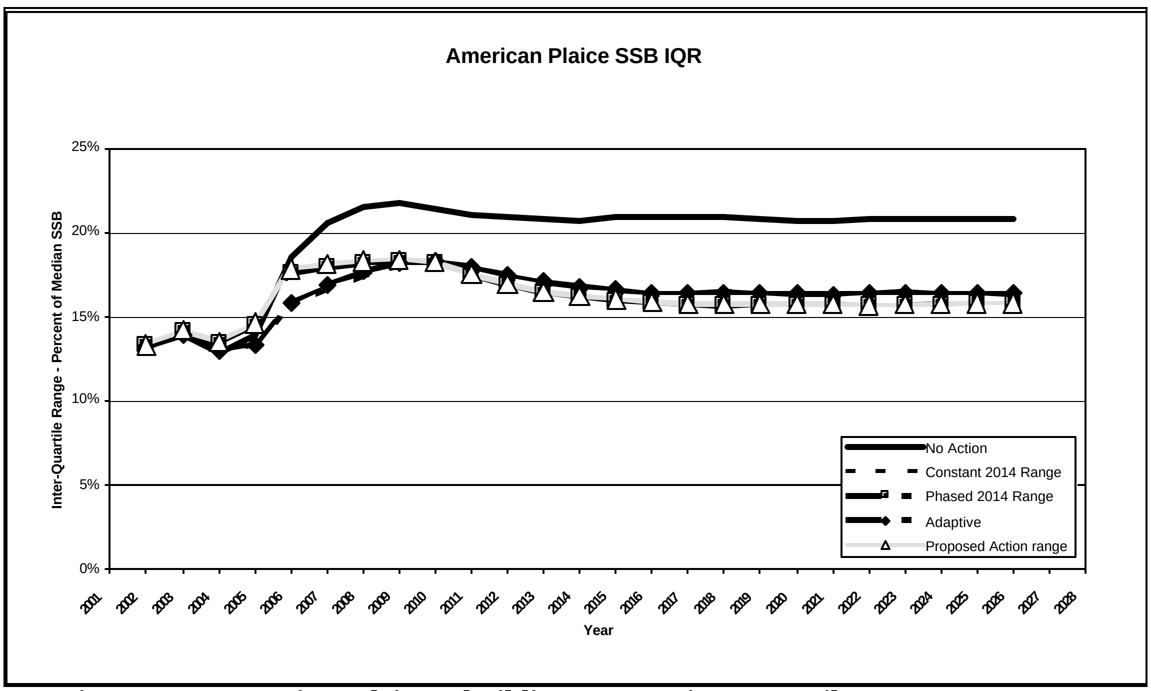


Figure 103 – American plaice rebuilding strategy inter-quartile ranges

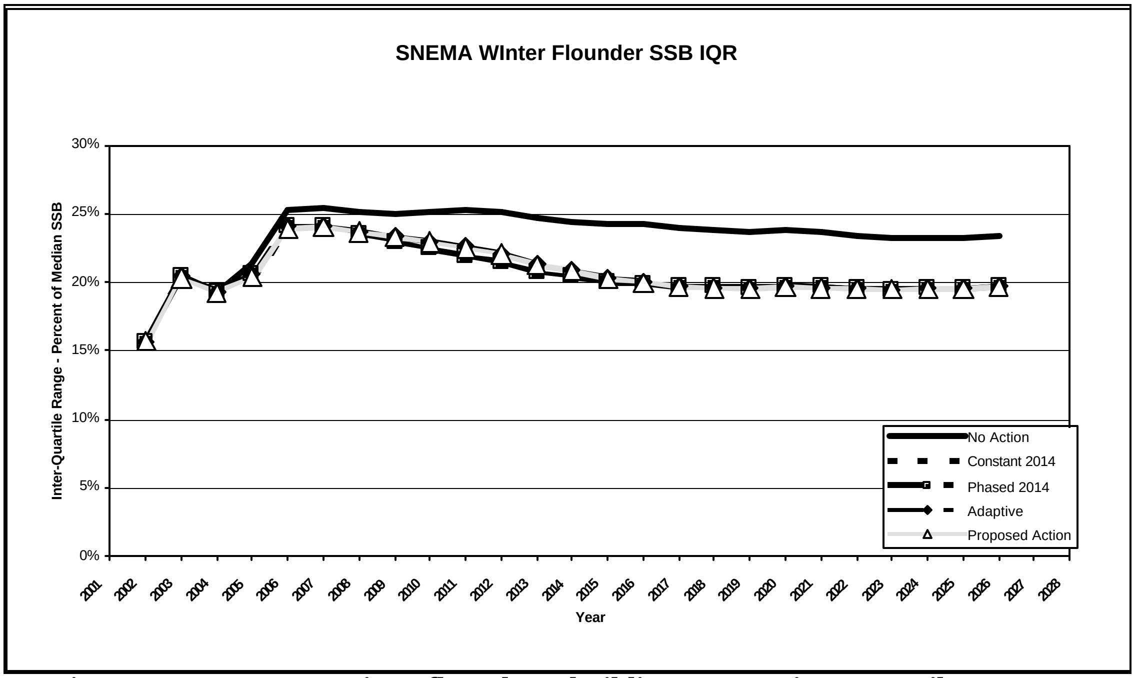


Figure 104 – SNE/MA winter flounder rebuilding strategy inter-quartile ranges

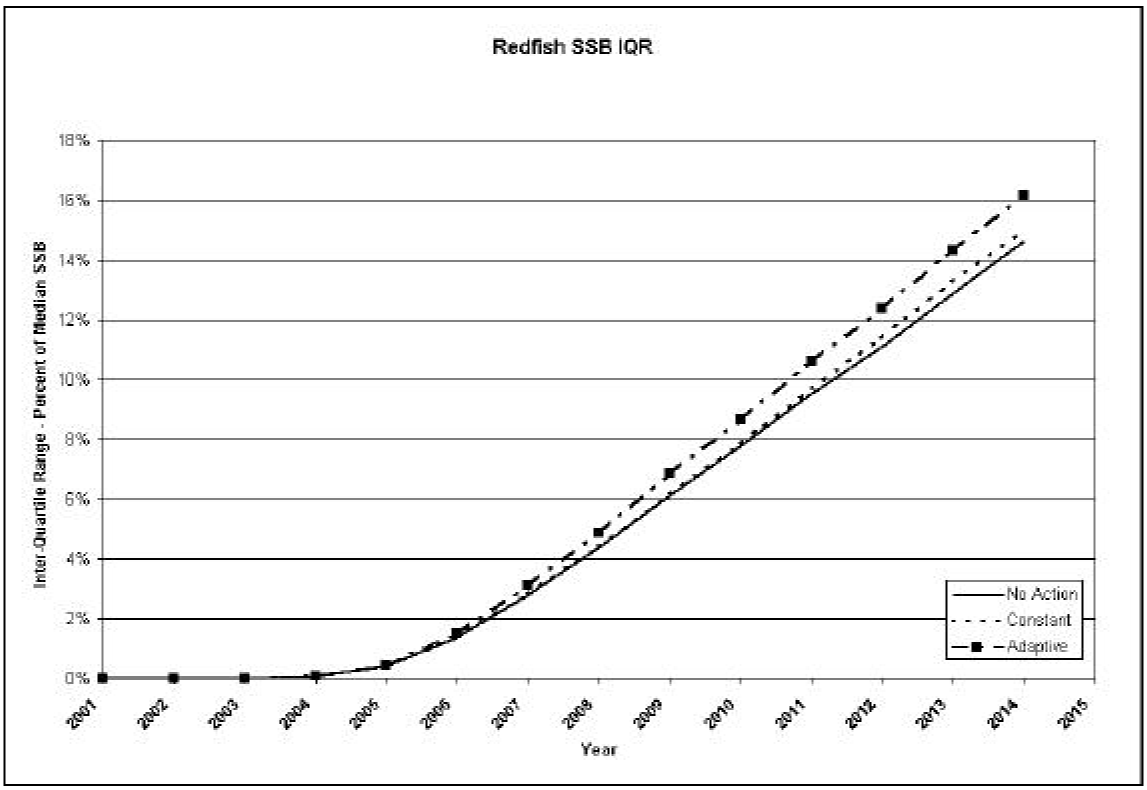


Figure 105 – Redfish rebuilding strategy inter-quartile ranges

5.2.2 Ending Overfishing

In addition to the stocks that require formal rebuilding programs, this Amendment is designed to end overfishing on witch flounder. Ending overfishing will also result in increases and stock size and achieving (or maintaining) the target biomass. An age-based projection for witch flounder illustrates this concept. Under the No Action alternative, witch flounder biomass is projected to increase rapidly to over 34,000 mt, but then decline to 10,000 mt by 2012. With overfishing ended, however, the stock is projected to increase to over 42,000 mt and remain above 22,000 mt well into the future.

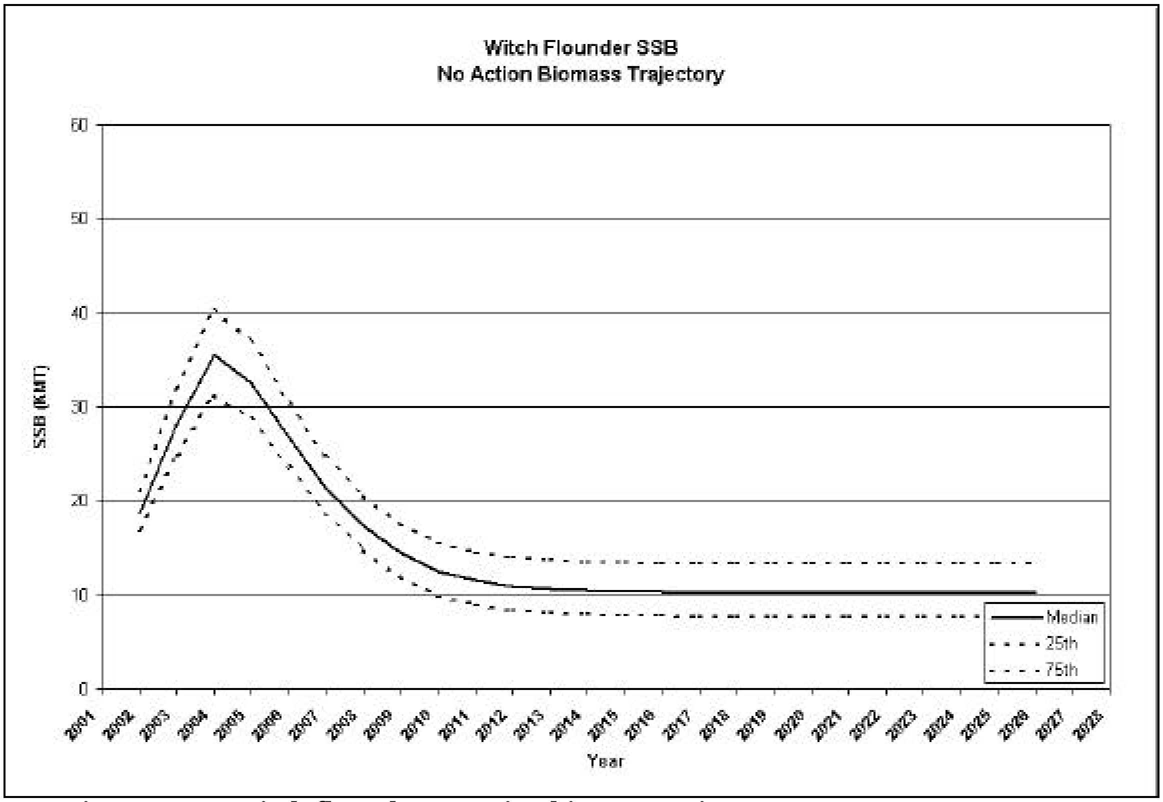


Figure 106 – Witch flounder no action biomass trajectory

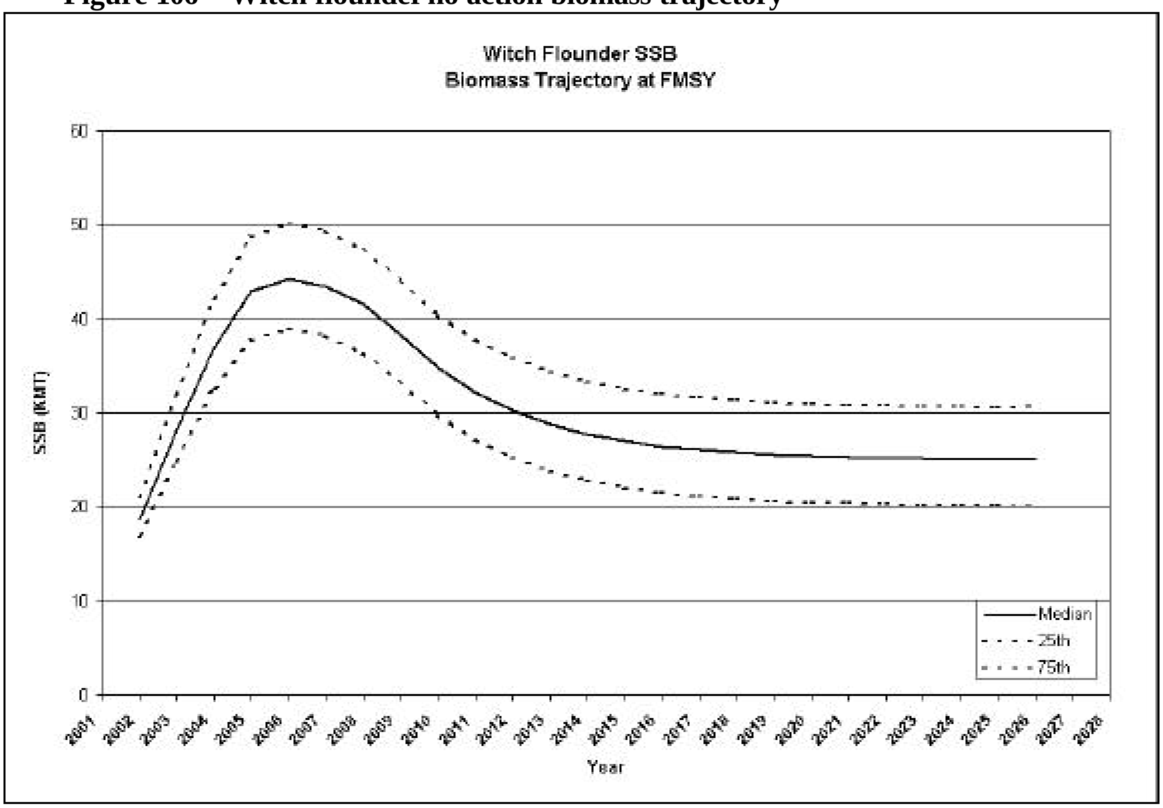


Figure 107 – Witch flounder F_{MSY} biomass trajectory

5.2.3 Groundfish Stocks Not Overfished/Overfishing Not Occurring

Amendment 13 manages all groundfish stocks to prevent overfishing and to prevent the stocks from being overfished. Age-based projections are available for two additional stocks that are not overfished, and where over-fishing is not occurring. GB yellowtail flounder and GOM winter flounder projected stock biomass are shown below. These charts assume a fishing mortality of F_{MSY} for both stocks, the maximum allowed before overfishing occurs, because measures will be adjusted under this amendment to maintain fishing mortality below that level. This fishing mortality rate may be higher than what will result under the proposed management measures, as is shown in 5.2.6. The projection show GB yellowtail flounder should approach SSB_{MSY} by 2013, and GOM winter flounder is currently well above SSB_{MSY} but should decline to that level around 2011.

Trajectories are not shown for index-based stocks (pollock and northern windowpane flounder). Expected biomass proxies are shown in Table 38. These proxies are developed by assuming that the exploitation index is equal to the F_{MSY} proxy. In the case of pollock, this represents an increase in the current exploitation index. For pollock , the proxy for SSB_{MSY} is achieved by 2014 at an exploitation rate equal to the F_{MSY} proxy. This means the No Action alternative would be a successful formal rebuilding program for this stock, if one were required. Northern Windowpane achieves its biomass target in 2012. Once again, the actual exploitation index under these measures may be lower.

Year	Northern Windowpane	Pollock (Area 5 & 6)
2002	0.86	1.73
2003	0.87	1.84
2004	0.87	1.94
2005	0.88	2.05
2006	0.89	2.15
2007	0.89	2.26
2008	0.90	2.37
2009	0.91	2.47
2010	0.91	2.58
2011	0.92	2.68
2012	0.93	2.79
2013	0.93	2.89
2014	0.94	3.00

Table 38 - Amendment 13 Projected Biomass Indices (kg/tow) for Survey Index-Based Groundfish Stocks

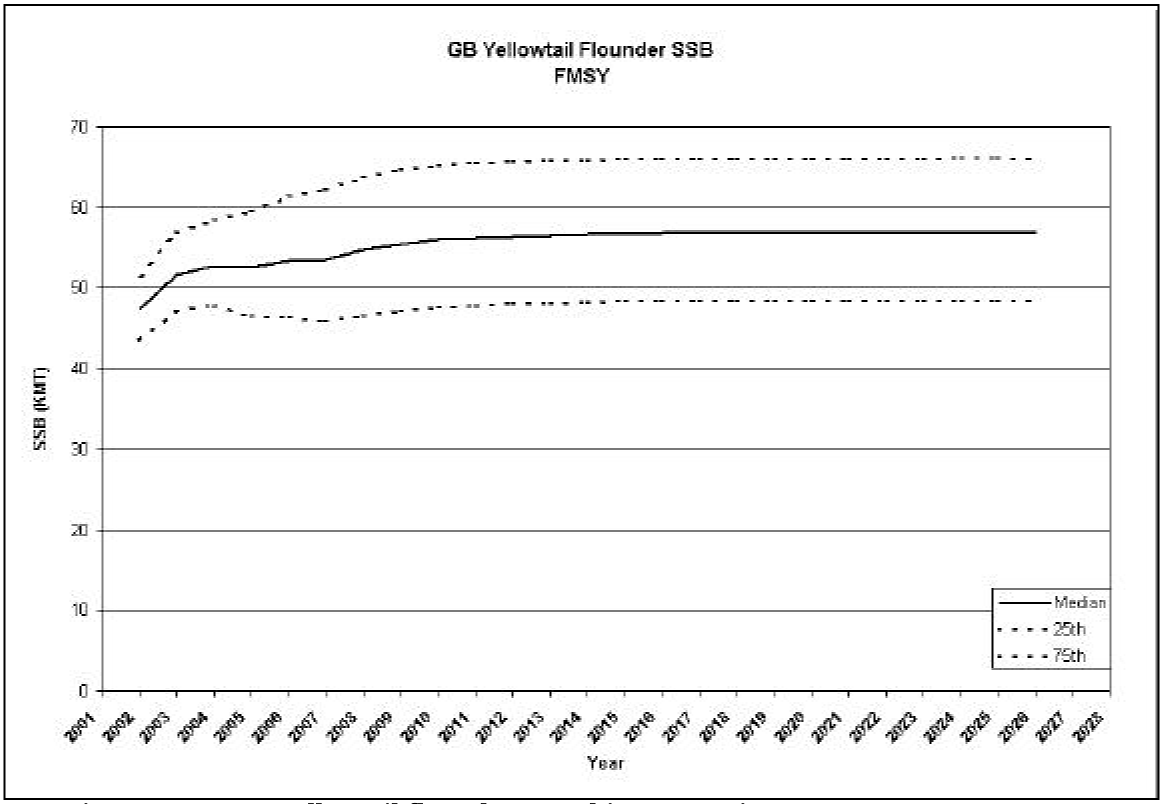


Figure 108 – GB yellowtail flounder F_{MSY} biomass trajectory

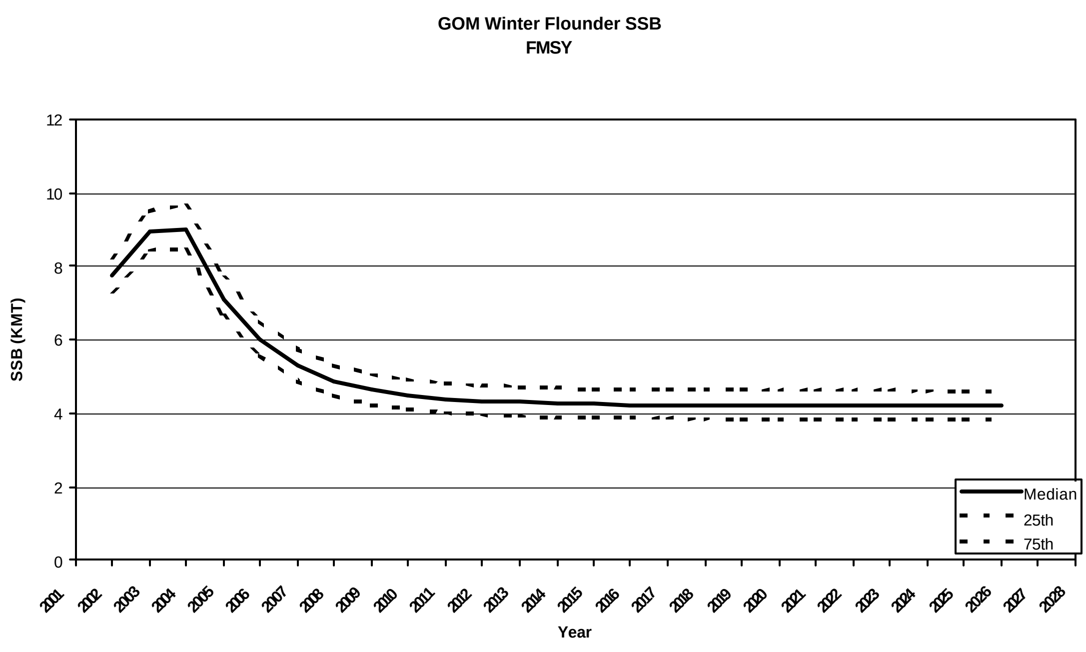


Figure 109 – GOM winter flounder F_{MSY} biomass trajectory

5.2.4 Biological Impacts of the Fishery Program Administration Measures

The biological impacts of Fishery Program Administration measures are discussed qualitatively.

5.2.4.1 Fishing Year

None of the alternatives (including no action) for changing the fishing year should affect fishing mortality. The fishing year is a purely administrative measure that is defined so that there is a set date for implementing new regulations and issuing DAS allocations. It has no direct or indirect effects on fishing mortality. Some argue (see Appendix XIII) that if the fishing year starts when fish are aggregated for spawning, fishing mortality increases because vessels immediately start using their new DAS allocation. This conclusion presumes that fishermen do not plan their fishing activity to take advantage of seasonal aggregations and market demand, but are tied to an arbitrary starting date.

The Council is proposing to adopt the No Action alternative. The fishing year will not change, and there will be no biological impacts.

5.2.4.2 DAS Proration

The DAS proration options are designed to address how DAS are allocated if the fishing year is changed. Option 1 could lead to a short-term increase in DAS (compared to the Amendment 13 target, not compared to No Action) and a resulting increase in effort because it bases DAS during any transition period on the DAS allocated in fishing year 2003. If this number is greater than the DAS allocated under Amendment 13, then the fishing mortality impacts of any effort reduction will be delayed and rebuilding targets may not be met during the first year of the Amendment. This is more of a problem the longer the transition period is, since not only will a larger share of the 2003 allocation be available, but vessels will have more time to use those DAS. Option 2, on the other hand, immediately uses the Amendment 13 DAS allocation during the transition period so that any mortality reduction that is targeted by changes in DAS will be effective immediately.

Because the fishing year has not been changed, neither of the DAS pro-ration options were adopted. There will be no biological impacts from this measure.

5.2.4.3 Periodic Adjustment Process

There are no expected affects on fishing mortality of modifying the schedule for periodic adjustments to the multispecies plan, or for keeping the current schedule (No Action). Extending the duration of time between each periodic review and adjustment of the multispecies FMP would allow such measures to take effect on the stocks, enabling the PDT to more accurately evaluate their performance in helping to achieve mortality and biomass targets for the managed stocks. There is no concern that a longer period between routine adjustments to the FMP may harm the stocks. As required by the M-S Act, NMFS reviews the status of each stock on an annual basis for a Report To Congress. If necessary, the Council can react to changes in stock status published through this report. In the case of a declaration that a stock is overfished or that overfishing is occurring, the Council is required by law to act within one year, regardless of the annual adjustment cycle.

The proposed action adopts the revised periodic adjustment process, and should not have nay biological impacts.

5.2.4.4 US/Canada Resource Sharing Understanding

The resource sharing understanding between the United States and Canada dos not have any direct impacts on stock rebuilding or fishing mortality. However, this does allow the two nations to more closely coordinate management and scientific understanding of transboundary Atlantic groundfish stocks. In addition, this agreement may encourage closer adherence to quotas (TACs) set for transboundary stocks.

The proposed action adopts this understanding. Indirectly, this understanding may promote adherence to M-S Act requirements to control fishing mortality. Absent this understanding (the No Action alternative), the two nations may not adequately coordinate removals from these stocks. This could result in excessive harvesting if, for example, one nation under-estimates the planned catches that will be allowed by another nation and sets its own harvest levels too high. It is also possible that a nation could over-estimate the harvest of the other nation, resulting in an unnecessary sacrifice in yield. Either result would prevent harvesting of OY in the long-term, preventing the achievement of the primary goal of the M-S Act.

5.2.4.5 Administration of Certified Bycatch/Exempted Fisheries

Regular review of certified bycatch/exempted fisheries will allow the Council to facilitate better compliance of these fisheries with bycatch standards. If it is demonstrated that an exempted fishery can no longer meet the criteria necessary for it to retain its status the Council can take timely action to ensure rebuilding of stocks is not compromised. Closer administration and review of bycatch/exempted fisheries will have indirect, positive impacts on the stocks. If this review reveals that bycatch is increasing, then appropriate changes to the program can be made if necessary to control fishing mortality of groundfish stocks.

The Council is proposing the No Action alternative. This will result in an ad hoc review of certified bycatch/exempted fisheries. The No Action alternative could have negative impacts through increased fishing mortality as a result of increased discards that are not detected because of a lack of a periodic review.

5.2.4.6 Special Access Programs

The Council is proposing to adopt the system of approval and implementation of Special Access Programs.

As stated in the criteria which must be met to participate in a special access program, the proposed SAP *must not increase fishing mortality on a stock of concern (that is stocks that are overfished or where overfishing is occurring)*. In other words, the SAP must be in compliance with biological targets set for all stocks. If implemented and monitored correctly, SAPs should not have negative biological impacts from a rebuilding standpoint. While SAPs will increase F on targeted species, it should not result in increased mortality on stocks of concern either through directed fishing or bycatch. In essence, this measure is conservation neutral. If it is determined that an existing SAP is (a) exceeding the allowable catch for stocks it is targeting, (b) adjusting or changing measures that minimized adverse impacts of fishing on habitat, or (c) increasing fishing mortality on stocks of concern, then that SAP will not be allowed to continue.

The extension of the SAP to other fisheries should not affect groundfish stocks because the criteria for approval is stringent: the SAP cannot affect stocks of concern. By requiring that any framework implementing a SAP be approved by the NEFMC, the Council responsible for groundfish management will be able to carefully evaluate SAPs for other fisheries to ensure compliance with groundfish management goals and objectives.

The no action alternative will not increase fishing mortality. In fact, it may prevent harvesting of some stocks and result in lower fishing mortality on those stocks.

5.2.4.6.1 Georges Bank Yellowtail Flounder Special Access Program

This access program is designed to target Georges Bank yellowtail flounder within the southern portion of CA II (south of 41-30 N). This stock is not overfished and overfishing is not occurring, so it does not meet the Amendment 13 definition of a stock of concern. TRAC 2001 reported the stock was rebuilt, but due to a re-estimated SSB_{MSY} in March 2002, the stock is currently below the target biomass, though stock size continues to increase. Fishing mortality is well below F_{MSY}: the GARM (2002) estimated 2001 fishing mortality as 0.13, and the preliminary estimate of 2002 mortality is only 0.15. Landings from this stock were 7,186 mt in 2001, and declined in 2002 as a result of reduced Canadian landings and reduced U.S. landings due to the measures adopted in the FW 33 court order. U.S. landings declined to about 2,600 mt in calendar year 2002, a thirty-three percent decrease from the previous calendar year. Through August 2003, landings were about nine percent higher than in calendar year 2002, but still twenty-five percent lower than in 2001.

The F_{MSY} fishing mortality threshold is 0.25, nearly twice the current fishing mortality. U.S. landings in fishing year 2001 were only 93 percent of the U.S. target TAC (4,618 mt). U.S. catch, which increased rapidly from 1996 through 2000, reached a plateau in 2000 and 2001 and has declined since (Table 39). Catch declines are likely due to management restrictions (including reduced DAS allocations and increases in mesh) in place as a result of the FW 33 court order and an inability to access yellowtail stocks inside Closed Area II.

Catch	1996	1997	1998	1999	2000	2001	2002
US	0.8	1.1	1.9	2.5	4.1	4.3	2.6
Canadian	0.5	0.8	1.2	2.0	2.9	2.9	2.0
Total	1.3	1.8	3.1	4.4	6.9	7.2	4.6

Table 39 – US and Canadian Georges Bank yellowtail flounder catch (landings and discards), thousands of metric tons (source: GARM 2002, 2002 data from NMFS unpublished dealer data).

Fishing at F_{MSY} – the maximum mortality allowed - in 2004 would produce a catch of almost 12,000 mt (US and Canadian combined). In other words, landings could more than double from recent levels before overfishing occurs. While the exact US and Canadian share of the harvest may be determined by a US/CA resource sharing understanding, a rough approximation is to assume a 60/40 split as observed in 2000 and 2001. US catch in 2004 under these percentages would be 8,000 mt, nearly twice the highest US catch observed in recent years, a level not seen since 1983 – prior to the implementation of DAS restrictions, increased mesh sizes, year round closed areas on Georges Bank, limited entry, and fishing capacity reduction programs.

This Special Access Program allows 320 trips at 30,000 pounds of yellowtail flounder per trip, meaning that if all 320 trips are made, approximately 11 million pounds (5,000 metric tons) of yellowtail flounder may be caught in the SAP area (Figure 110), though higher discard rates than what is assumed in this analysis may shift the total catch upwards. All of these trips must take place during the June through December period authorized for the access program.

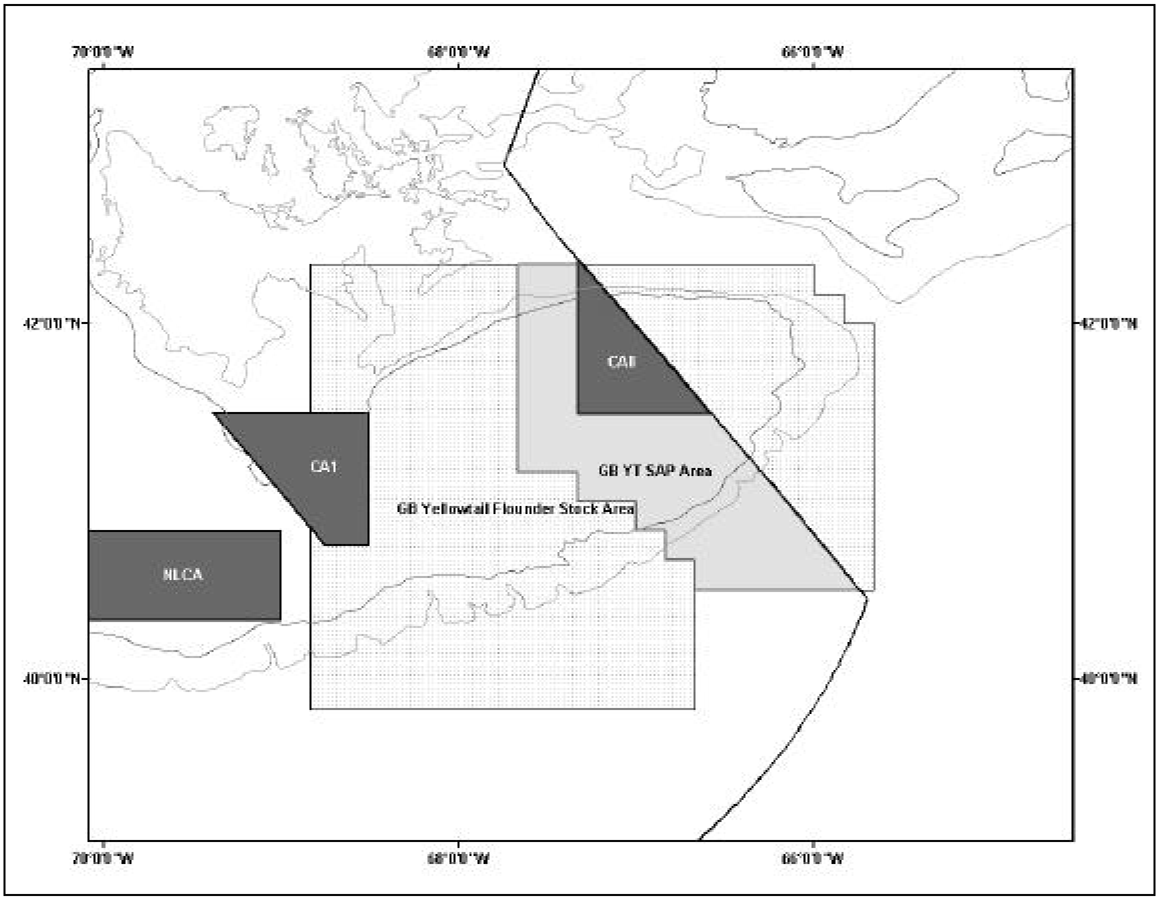


Figure 110 - GB yellowtail flounder stock area and the GB yellowtail flounder SAP area

Trends in the Georges Bank Yellowtail Flounder fishery

To gain a sense of how much of an increase from recent activity may result from this program, VTR records for fishing years 1995 through 2001 were examined to identify trips reported in the GB yellowtail flounder stock area. Since 98 percent of the yellowtail flounder was caught by trawl vessels, only these trips were examined. The number of trawl trips reporting landings of yellowtail flounder increased from 672 (44 percent of trawl trips landing groundfish from this area) in 1995 to 920 (67 percent of trawl trips landing groundfish) in 2001 over this period. In recent years, about ninety percent of the yellowtail trips from this area landed 20,000 pounds or less (Table 40). The proposed CA II access program can accommodate a tripling in the number of trips that land 30,000 pounds of yellowtail flounder compared to recent activity. If a scallop vessel controlled access program is implemented for CAII, then any yellowtail flounder bycatch TAC would be subtracted from the GB yellowtail flounder TAC and may require the RA to reduce the number of authorized trips.

Recent activity outside the closed area may not be a good indicator of future activity inside the area. In particular, yellowtail flounder catch rates in the area are expected to be higher, at least when the program is initiated, because there may have been some aggregation of the stock inside the closed area since fishing for groundfish in the area has been prohibited since 1994. Because vessels will be limited in the number of pounds of yellowtail landed per trip, the increased catch rates will only threaten mortality objectives if there are more trips into the area as a result. The maximum of 320 trips placed on this program should, therefore, control yellowtail flounder mortality.

	1995	1996	1997	1998	1999	2000	2001
Pounds Landed	*Number of Trips*						
0	0	0	0	0	0	0	0
1,000	330	419	340	284	270	201	262
5,000	202	236	201	227	200	114	231
10,000	13	86	95	93	138	64	147
20,000	0	16	33	84	74	85	169
30,000	0	0	3	25	22	43	77
More	0	0	0	1	22	30	34
Total Trips	545	757	672	714	726	537	920
Number of	116	119	139	153	174	153	189

Table 40 – Number of trawl trips reporting GB yellowtail flounder, fishing year 1995 through 2001 (Source: NMFS unpublished VTR data)

Results of experimental Georges Bank Yellowtail Flounder fishery inside Closed Area II

Data provided by the Manomet Center for Conservation Sciences, taken during a September through December (2002) experimental fishery inside the yellowtail access area, indicates high catch rates for yellowtail flounder with the potential for significant bycatch of scallops, winter skate, little skate, and, to a lesser degree, winter flounder, haddock and monkfish. Data on bycatch is discussed in detail in section 5.2.8.2.5.

The experimental fishery used two vessels fishing simultaneously inside a grid pattern. The vessels fished paired tows (i.e. both vessels inside the same grid block fishing alongside each other) every fifth grid block, with one vessel fishing alone in each block in between. Vessels began their fishing at the southwest corner of closed area II and proceeded over and upwards in a zigzagging fashion, fishing grid blocks going east, then moving north one row and fishing grid blocks going west, until all blocks were fished. This pattern was repeated once monthly from September through December. It should be noted that in September a number of the northernmost blocks were not fished due to bad weather. Figure 111 shows the locations of each tow and grid pattern used in the experimental fishery. Yellowtail flounder catches were high throughout the access area, but tended to be highest in the northern and central grid blocks. The following table (Table 41) shows descriptive statistics for the per-tow, per-grid block breakdown of yellowtail catch. Table 42 shows the mean, median, std deviation and 75th percentile for each month individually.

Total and average catch for this fishery, including other species, is summarized in Table 115 and includes an analysis of probable bycatch.

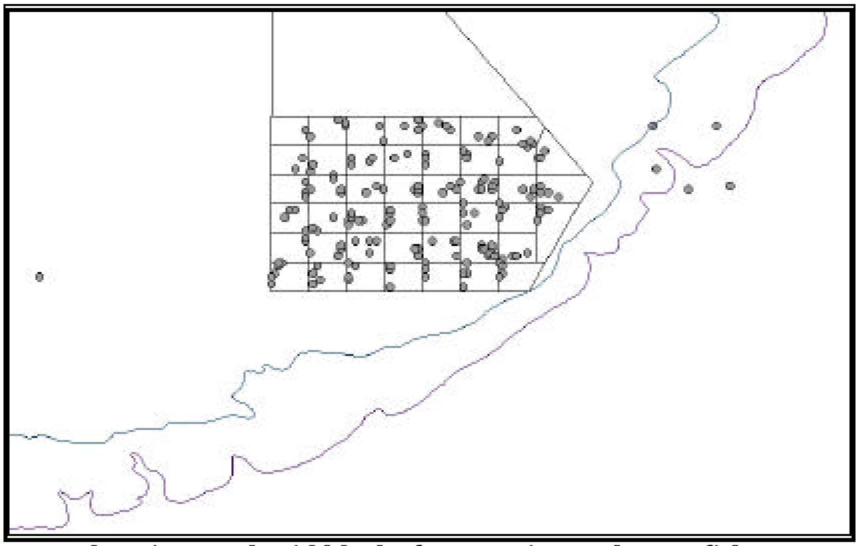


Figure 111 – Tow locations and grid blocks for experimental CAII fishery, Sep-Dec 2002 (source: Manomet Center for Conservation Sciences).

Mean	119.40
Median	92.33
Std Deviation	99.73
Variance	99.47
100% Max	369.42
99%	369.42
95%	291.76
90%	272.75
75% Q3	190.14
50% Median	92.33
25% Q1	32.93
10%	21.63
5%	14.07
1%	5.52
0% Min	5.52

Table 41 – Descriptive statistics for mean weight of yellowtail flounder per tow, per grid block (source: Manomet Center for Conservation Sciences).

	Mean	Median	St Dev	75th %
September	107	31.8	147.5	163.3
October	58	27.0	79.0	47.8
November	140	102.5	142.8	171.2
December	113	64.3	137.8	154.2

Table 42 - Descriptive statistics for mean wt of yellowtail flounder per tow, per grid block for each month of the experimental fishery.

The model for analysis of this SAP assumes that vessels will concentrate in the areas of highest yellowtail abundance. Based on the results of the experimental fishery (Table 42), the yellowtail access fishery is assumed to be concentrated within the grid blocks shown in Figure 113. While Manomet-provided data includes only four months of fishing, and the specific areas of concentration may change from year to year, the co-location of species and bycatch rates observed when fishing in the areas of highest yellowtail concentration are likely to be a superior predictor of anticipated catch rates than rates averaged across the entire fishing area.

To establish the modeled SAP fishery inside Closed Area II, data are refined as follows. Table 42 shows a mean weight per tow of 119 lbs for yellowtail flounder for the entire closed area. Yellowtail flounder mean weight per tow inside the areas in Figure 113 (areas of highest concentration) is 267 lbs, and this is the number used to establish anticipated catch rates. Tow duration for this experimental fishery is known to average 20 minutes. Catch rates from the areas of high yellowtail concentration are therefore multiplied by six to estimate two-hour tows. Eight tows per day are assumed. While this leaves quite a bit of excess time, even considering hauling back and setting out, eight tows per day is thought to be more conservative and may provide a more accurate overall picture given the many assumptions made in modeling this access program.

Allowable yellowtail catch per trip is adjusted for undersized yellowtail flounder discards in order to accurately predict the number of tows and duration of trips inside the exempted area. During the experimental fishery, approximately 90% of all yellowtail sampled were of legal size (greater than 33 cm or 13 inches). Assuming that the sampling was truly random, a yellowtail catch of 34,483 lbs is equal to legal-sized yellowtail landings of 30,000 lbs. Allowable yellowtail catch per trip is adjusted for undersized yellowtail flounder discards in order to accurately predict the number of tows and duration of trips inside the exempted area. Catch rates are assumed to remain constant, an assumption which may overestimate the biological impacts of this SAP.

Total sampled	2,695
(Average size)	15.9 in
Total undersized	251
(Average size)	11.9 in
Total legal size	2,347
(Average size)	16.5 in
Legal size / sample	0.87

Table 43 – Sampling statistics from experimental yellowtail fishery (Sep – Dec, 2002; source: Manomet Center for Conservation Sciences).

Avg Trip Duration	# Trips	Total estimated A or B DAS used
2.16	320	690

Table 44 – Modeled trip duration, number of trips and estimated DAS usage for yellowtail access program fishery.

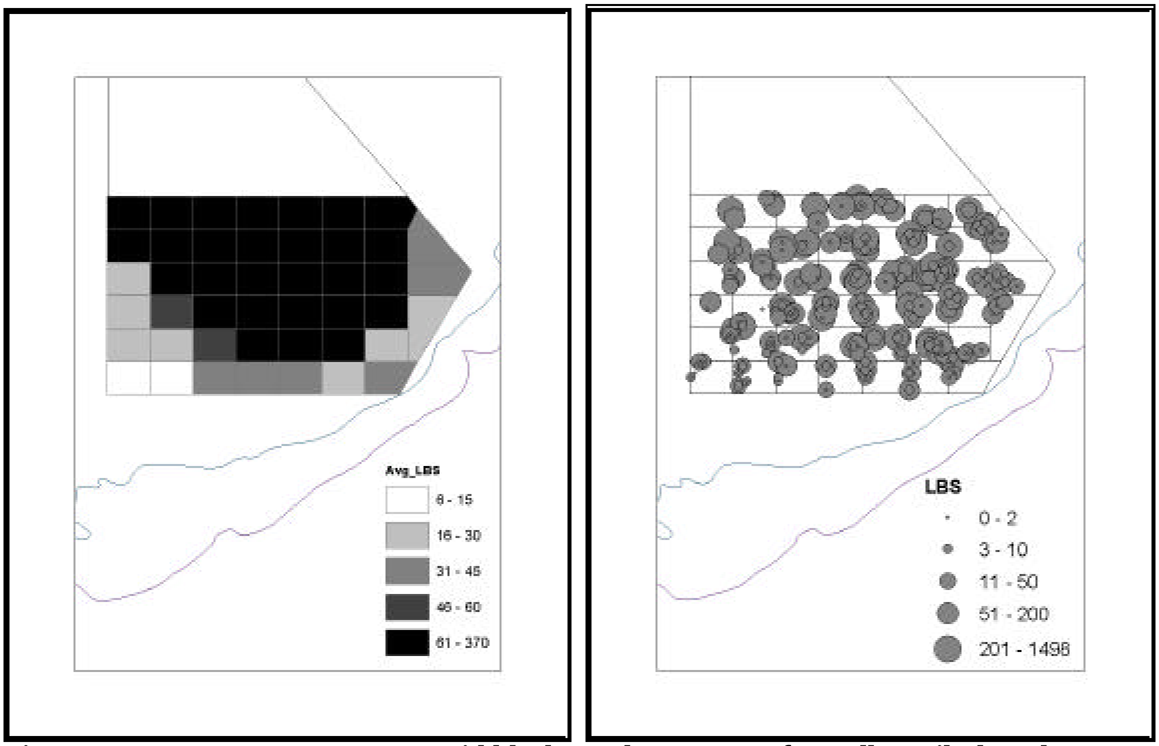


Figure 112 - Mean wt per tow per grid block, total wt per tow for Yellowtail Flounder (source: Manomet Center for Conservation Sciences).

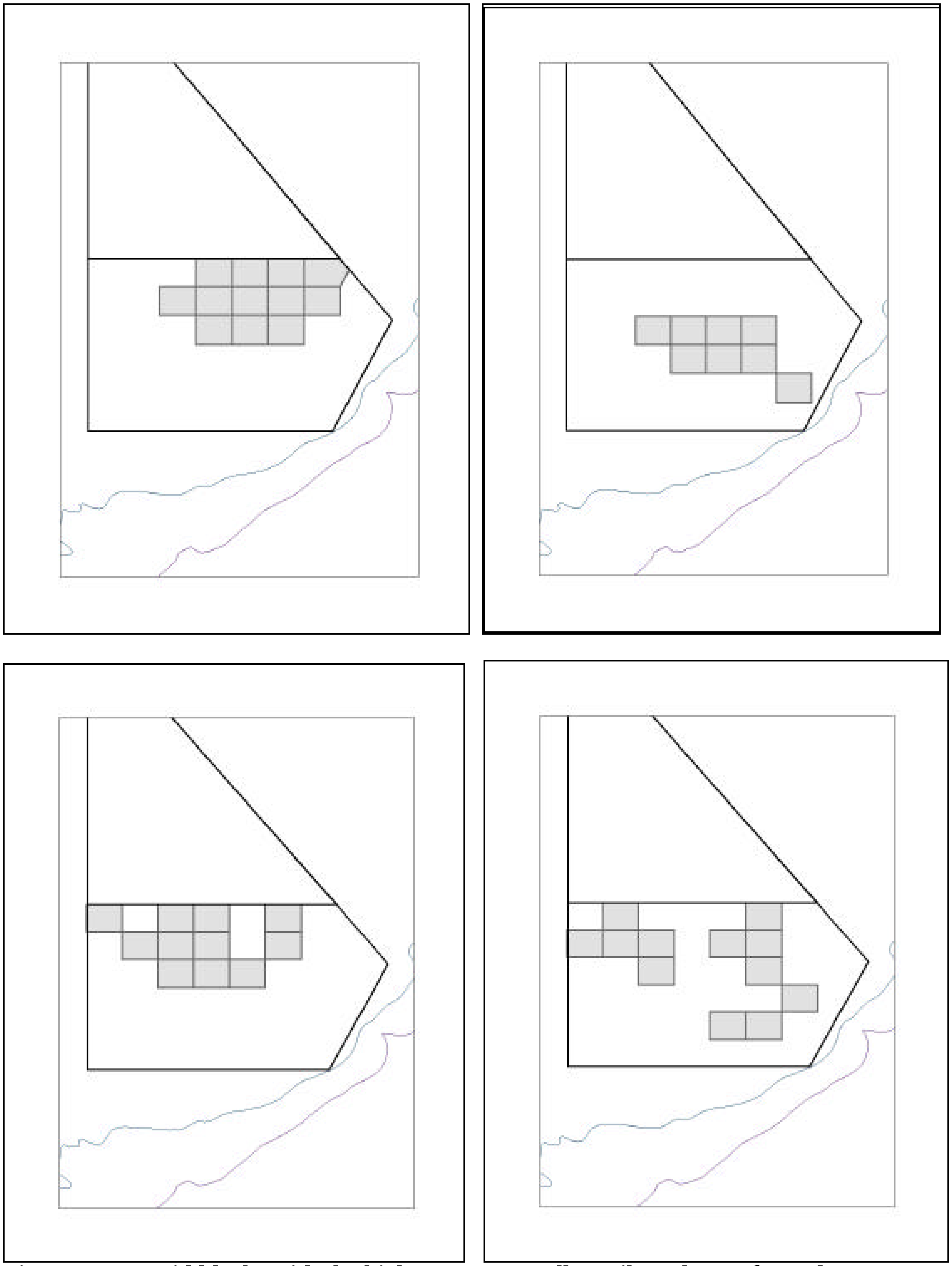


Figure 113 – Grid blocks with the highest average yellowtail catch rate from the experimental fishery in order from September through December, respectively (source: Manomet Center for Conservation Sciences).

This program does not explicitly include a hard TAC on the yellowtail catch, and any catch of over 5,000 mt, coupled with a catch of up to 3,000 mt from trips fishing outside of this SAP, may increase fishing mortality beyond the target.

The program is designed to accommodate two trips per month per vessel. In calendar year 2002, 117 vessels reported landing yellowtail flounder caught in statistical areas 561 and 562 (Table 45—areas inside the SAP). If only these vessels were to participate in the exempted fishery, it could be expected to last anywhere from four to six weeks before 320 trips are taken and approximately 5,000 mt of yellowtail is caught under this program. If additional vessels chose to participate, the duration of the program may be proportionally shorter. On the other hand, only 40 vessels of the 117 fishing in 2002 inside the areas have registered VMS units onboard (a requirement for participation in this SAP). If only these vessels were to participate, and each made two trips per month, the program could be expected to last four months.

The yellowtail closed area access fishery was modeled for the months of September through December under the assumption that the catch rates for all species observed during the experimental fishery would be consistent for vessels fishing in the yellowtail access fishery. Vessel characteristics of the vessels used in this experimental fishery and those of vessels who fished for yellowtail flounder in statistical areas 525 or 562 (the Southeast Part of Georges Bank) are shown in Table 45, Table 46 and Table 47 below. Vessels participating in the experimental fishery had slightly higher average gross tonnage and horsepower. To the extent that horsepower and gross tonnage contribute to catch rates, a model based on landings from the experimental fishery may slightly overestimate catch rates expected from the access program fishery.

Variable	N	Mean	Std Dev	Minimum	Maximum
GTONS	117	143.1	32.0	66	246
LEN	117	77.2	7.9	61	111
VHP	117	673.2	255.7	350	1550

Table 45 – Descriptive statistics for all vessels reporting landings of yellowtail flounder within statistical areas 562 and 561 (2002 calendar year; source: NMFS unpublished VTR data).

Variable	N	Mean	Std Dev	Minimum	Maximum
GTONS	40	148.7	33.9	66	201
LEN	40	78.7	8.5	61	106
VHP	40	715.4	249.7	350	1380

Table 46 – Descriptive statistics for all vessels reporting landings of yellowtail flounder within statistical areas 562 and 561 in calendar year 2002 with registered VMS units onboard (source: NMFS unpublished VTR and VMS data).

Variable	N	Mean	Std Dev	Minimum	Maximum
GTONS	7	161.2	20.8	129.6	181
LEN	7	79.8	5.6	71	85.1
VHP	7	726.5	140.9	550	940

Table 47 – Descriptive statistics for all vessels participating in Sep-Dec experimental CAII fishery (source: Manomet Center for Conservation Sciences).

Catch rates in the SAP area for tows inside and outside Closed Area II

The estimates summarized thus far assume that the SAP fishery will be prosecuted entirely inside CAII. While it is likely that catch rates for yellowtail flounder will be higher inside CAII, the specifications for this SAP allow fishing anywhere in the 5zjm NAFO statistical area (Figure 110). To ascertain the extent to which vessels participating in this program are likely to fish inside the closed area, the differences in yellowtail flounder catch rates inside and outside Closed Area II are examined here.

Variable	N	Mean	Std Dev	Minimum	Maximum
GTONS	30	145.0	33.9	72	199
LEN	31	81.2	9.0	62	96
VHP	31	636.9	209.0	225	1180

Table 48 – Descriptive statistics for all vessels fishing inside area 5zjm carrying observers in months between June and Dec, 2000 through the present (source: NMFS unpublished observer data).

Trips occurring between June and December and carrying an observer are examined. Table 48 shows that the average size and horsepower of observer-carrying vessels fishing in the SAP area is slightly less than the size and horsepower of vessels participating in the CAII experimental fishery but consistent with vessels not observer-equipped that reported fishing in this area. To the extent that there is a relationship between these variables and catch, observed tows may have slightly lower catch rates for a given stock size.

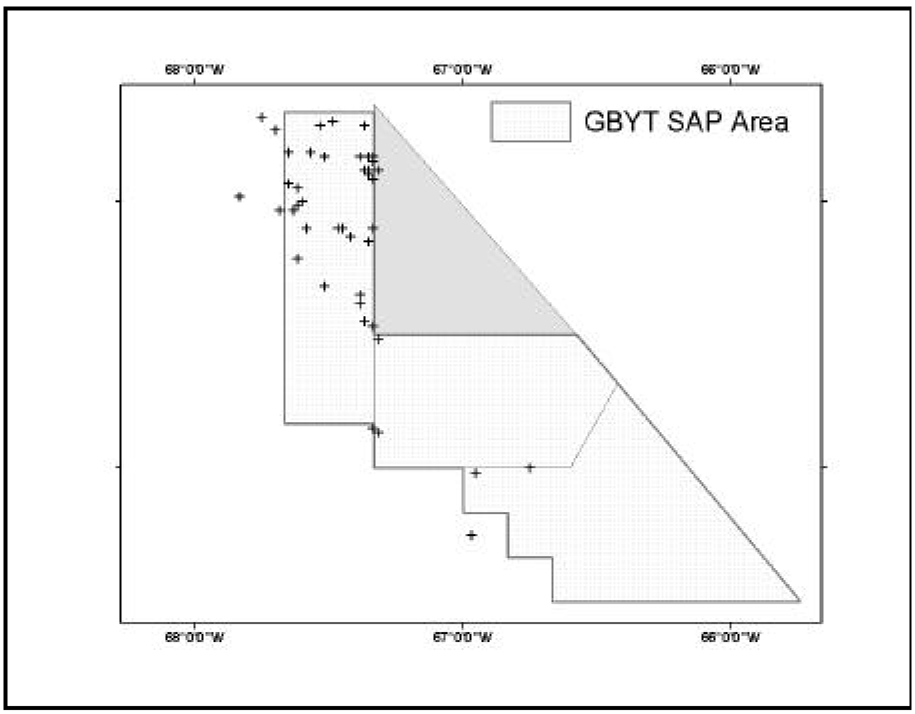


Figure 114 – Locations of observed tows inside area 5zjm (source: NMFS unpublished observer data).

Area	observed trips	observed tows	months	mean yellowtail flounder catch/hour
5zjm	44	327	Jun - Dec	76.7
CAII (experimental fishery)	8	187	Sep - Dec	356.2

Table 49 – Mean yellowtail flounder catch per hour inside CAII and in the SAP area overall (source: NMFS unpublished observer data, Manomet Center for Conservation Sciences).

Area	observed trips	observed tows	months	mean yellowtail flounder catch/hour
5zjm (trips south of 41-30 N only)	14	85	Sep - Dec	94.1
CAII (experimental fishery)	8	187	Sep - Dec	356.2

Table 50 – Mean yellowtail flounder catch per hour inside CAII and in the SAP area south of 41-30 N (source: NMFS unpublished observer data, Manomet Center for Conservation Sciences).

Catch rates for yellowtail flounder throughout the 5zjm area on observed trips differ significantly from those inside Closed Area II (Table 49). Observed trips made in the 5zjm area south of 41-30 N (only) were also examined, revealing a slightly higher catch rate for yellowtail flounder in the southern portions of the 5zjm area outside of CAII, though this rate is still significantly lower than that seen during the CAII experimental fishery (Table 50).

The implication of these data is that vessels targeting yellowtail flounder are likely to fish inside Closed Area II, vice outside the area, while harvesting the 30,000 lbs of yellowtail per trip available under this SAP. Therefore, the data from the experimental fishery appears sufficient (with the notable exception of the months not covered under the experimental fishery--June, July and August) for the purpose of predicting the biological impacts of this program on yellowtail flounder. 320 trips will yield landings of 4,350 metric tons of yellowtail flounder (just over 5,000 mt total catch, including discards) and, if vessels chose only to target yellowtail flounder and not fish in other portions of the 5zjm area, the bycatch impacts discussed in section 5.2.8.2.5, which indicate relatively small impacts on all non-target species, are likely to apply. Table 51 summarizes the potential yellowtail landings at three different numbers of trips, as a basis for comparison.

Avg Trip Duration	YT catch (250 trips)	*YT catch (320 trips)*	YT catch (400 Trips)	# DAS (250 trips)	# DAS (320 trips)	# DAS (400 trips)
2.16	3,916	***5,005***	6,256	540	691.2	864

Table 51 - Modeled trip duration, estimated catch (in metric tons) and estimated DAS (either A or B) usage for yellowtail access program fishery.

Biological impacts on cod, haddock and winter flounder

Vessels that choose to participate in this SAP are allowed to fish inside the 5zjm statistical area while using category A or category B days and either a haddock separator trawl or a flatfish net, and receive credit for steaming time credit (no DAS used in transit). Therefore, vessels are unrestricted in their fishing after (or before, or during) catching their 30,000 lbs of yellowtail, so long as they use a haddock separator trawl or flatfish net when fishing outside CAII.

Observed catch rates inside and outside Closed Area II differ dramatically on all species, and this program may have a significant impact on the overall landings for GB cod, GB winter flounder and haddock in particular. Impacts on other species are addressed in section 5.2.8.2.5.

Analysis indicates that, if vessels fish exclusively in the high-yellowtail catch areas inside CAII (Figure 113), it should take only 2.16 days to catch 34,483 lbs of yellowtail flounder (equivalent to landings of 30,000 lbs). Table 52 shows the anticipated catch that corresponds to various numbers of trips targeting yellowtail flounder exclusively.

Species	250 trips	*320 trips*	400 trips
COD, ATLANTIC	9.4	***12.1***	15.1
FLOUNDER, WINTER (BLACKBACK)	744.1	***952.4***	1,190.5
HADDOCK	135.6	***173.6***	217.0

Table 52 – Estimated catch (mt) of three species while targeting yellowtail flounder (source: Manomet Center for Conservation Sciences).

However, vessels are expected to guard against single-species price fluctuations by "topping off" their SAP trips with catches from outside CAII. Catch rates from observer data are highest in the SAP area for cod, haddock and winter flounder and these are the species that vessels can be expected to "top off" with during their SAP trip. Because the GB cod trip limit is particularly low (1/5 the prescribed trip limit of 500 lbs per day), vessels are likely to target expressly haddock and winter flounder, using either a flatfish net or haddock separator trawl. According to the observer data, catch rates for winter flounder and haddock are highest in the statistical area 562 portion of the SAP area, while catch rates for cod are highest in the statistical area 561 portion of the area.

Analysis of VTR data for trips made within the 5zjm area indicates that the mean trip duration for trips in the specified area is 6.51 days. Assuming, conservatively, 22 hours each way for transit time (an average transit speed of 8 knots), the average fishing time for trips in this area is 4.67 days. If vessels are expected to catch their yellowtail trip in 2.16 days (Table 51), on average it may be assumed that vessels will continue to fish for another 2.5 days while participating in this SAP. This will result in 800 A or B DAS being used under this program (at 250 trips, 625 DAS are estimated to be used while at 400 trips 1,000 additional DAS are estimated to be used).

n	286
Min	0.2
Max	17.25
Mean	6.5
St Dev	2.42

Table 53 – Number of trips and trip duration data for VTR-reported trips occurring inside 5zjm (source: unpublished VTR data).

The haddock separator trawl has been found to reduce cod catches by up to 60%. For this analysis, a conservative estimate of 50% was used since the there is limited experience with the net use by U.S. fishermen on GB. Georges Bank winter flounder catch rates were similarly reduced for trips using the haddock separator trawl. All other catch rates are assumed to be consistent with observer data.

If vessels fish in the 5zjm area for 2.5 additional days, they can be expected to catch a significant amount of haddock, winter flounder and cod (Table 54). *Note that the data in this table reflect what would be expected if all trips fished an additional 2.5 days targeting either exclusively* *haddock or exclusively winter flounder. This bounds the potential impacts on both species, with the expected catches to fall somewhere between the predictions in the two columns.*

Targeting Haddock*					Targeting Winter Flounder		
keep	**discard**	**total catch**			**keep**	**discard**	**total catch**
14	95	109	**Per tow (lbs)**	**Cod**	14	67	82
303	4	307		**Winter Fl**	1,122	4	1,126
230	17	214		**Haddock**	99	10	109
100	665	765	**Per day (7 tows, lbs)**	**Cod**	100	471	571
2,122	31	2,152		**Winter Fl**	7,851	30	7,881
1,612	118	1,730		**Haddock**	694	68	762
250	1,663	1,913	**Per trip (add'l 2.5 days, lbs)**	**Cod**	250	1,177	1,427
5,304	77	5,381		**Winter Fl**	19,627	75	19,701
4,031	294	4,325		**Haddock**	1,736	170	1,906
64	134	198	**250 Trips (metric tons)**	**Cod**	64	98	162
593	9	601		**Winter Fl**	2,226	8	2,234
424	33	457		**Haddock**	197	19	216
82	***172***	***254***	***320 Trips (metric tons)***	***Cod***	82	125	207
759	***11***	***770***		***Winter Fl***	2,849	11	2,860
542	***43***	***585***		***Haddock***	252	25	277
103	214	317	**400 Trips (metric tons)**	**Cod**	103	156	259
948	14	962		**Winter Fl**	3,561	14	3,575
678	53	731		**Haddock**	315	31	346

Table 54 – Estimated catch for additional 2.5 days fishing time inside area 5zjm based on observer data from tows in areas 561 or 562. *The data from the 561 and 562 columns are not intended to be combined, but rather reflect the estimated maximum if all fishing were to take place entirely inside one area or the other. Anticipated catches would range somewhere between the numbers in the 561 and 562 columns.* (*Assumes 50% reduction in cod and winter flounder catch due to haddock separator trawl, and no change in behavior based on cod discard rates).

Table 55 (below) details the estimated cumulative impacts on cod, haddock and winter flounder for this Special Access Program. If the high-end estimates are assumed for all three species, GB haddock catch in this program may catch roughly 4% of the total GB haddock (US and CA) TAC. Catch of GB cod could may consume roughly 7% of the combined US and CA TAC. Landings of GB winter flounder, however, may achieve 127% of the US TAC if all 320 trips fish for 2.5 days outside CAII targeting winter flounder. Expected catch would be somewhere in between the two estimates below, but it should be noted that the low end estimate, which assumes a 50% reduction in catch due to the use of a haddock separator trawl, achieves 57% of the GB winter flounder TAC.

Targeting Haddock*					Targeting Winter Flounder		
keep	**discard**	**total catch**			**keep**	**discard**	**total catch**
74	134	208	**250 Trips (metric tons)**	**Cod**	74	98	171
1,326	20	1,346		**Winter Fl**	2,351	19	2,370
549	44	593		**Haddock**	197	30	227
94	***172***	***266***	***320 Trips (metric tons)***	***Cod***	***94***	***125***	***219***
1,697	***25***	***1,722***		***Winter Fl***	***3,787***	***25***	***3,812***
702	***56***	***759***		***Haddock***	***412***	***38***	***450***
118	214	332	**400 Trips (metric tons)**	**Cod**	118	156	274
2,121	31	2,153		**Winter Fl**	4,734	31	4,765
878	70	948		**Haddock**	515	48	563

Table 55 – Cumulative estimated impacts of SAP trips (at 6.5 days per trip) on cod, haddock and winter flounder. (*Assumes 50% reduction in cod and winter flounder catch due to haddock separator trawl, and no change in behavior based on cod discard rates).

5.2.4.6.2 Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program

The Council is proposing to adopt this program. This measure allows the retention and landing of small quantities of winter flounder while fishing with fluke mesh and while not on a DAS. The provision would only apply in the area west of 72-30W. Under Amendment 7 and its subsequent frameworks, vessels landing winter flounder from this area were allowed to use fluke mesh but had to use a DAS. The FW 33 court order changed the definition of the SNE Regulated Mesh Area; as a result, vessels were required to use mesh larger than fluke mesh while fishing on a DAS and landing winter flounder. The impacts of this measure depend on the number of fluke trips that will take place that catch and discard winter flounder. VTRs from this area were examined to determine the number of fluke trips taking place in this area, how often fluke and winter flounder are caught on the same trips, and in what quantities. Observer/sea sampling data was also examined to evaluate the extent of discarding of winter flounder on trips that landed fluke.

Sea sampling data for trips landing fluke from statistical areas 600 (or greater) were examined for the years 2001, 2002, and 2003. These statistical areas are slightly larger than the proposed area for this measure, but using them facilitates analyzing available data. Trips were pooled by quarter (January – April, May – August, September through December) and over all three years. A total of 197 trips were observed, with 61 in the first quarter, 74 in the second quarter, and 62 in the third quarter. There were few observed trips that landed fluke and winter flounder: none in the first quarter, one in the second quarter, and five in the third quarter. Only a few trips discarded winter flounder while landing fluke: one in the first quarter, six in the second quarter, and six in the third quarter. All but one of the trips discarded less than 200 pounds of winter flounder. The percentage of observed trips that discarded winter flounder was 2 percent in the first quarter, 8 percent in the second quarter, and 10 percent in the third quarter (Table 56). Sea sampling data are sparse, but suggest that there is a seasonal component to winter flounder discards and that winter flounder is not often caught by vessels landing fluke.

A different picture emerges from examining VTRs for trips that used fluke mesh (5.5 inch) in statistical areas 600 and above. While only 6 percent of the observed trips landed winter flounder, fully 18 percent of the VTR trips reported landing winter flounder. 2,182 trips recorded discards of between 1 and 100 pounds of winter flounder in calendar year 2001. There were no reported instances of discarding more than 100 pounds of winter flounder. Another 1,938 trips reported landing between 0 and 200 pounds of winter flounder, presumably while fishing on a DAS. The VTRs do show a slight increase in the number of trips encountering winter flounder in the second and third trimesters of the calendar year.

If there are roughly 2,200 additional trips landing 200 pounds of winter flounder as a result of this measure, winter flounder landings would increase by 200 mt. (440,000 pounds). This would not represent an increase in mortality, since this it is a conversion of discards into landings. A possible increase in mortality (as compared to not implementing the program) could occur because the trips that landed winter flounder of between 0 and 200 pounds while using fluke mesh would no longer be required to use a DAS. It should be noted, however, that analysis of the rebuilding alternatives show that this increase is not likely to be a concern. The proposed action is expected to reduce SNE/MA winter flounder mortality more than is necessary.

The 2004 TAC for SNE/MA winter flounder is likely to be about 2,800 mt, so an increase of 200 mt of landings represents less than 10 percent of the TAC. As shown in the biological impacts (section 5.2.6), the proposed action reduces fishing mortality on SNE/MA winter flounder more than is necessary. The additional catches generated by this measure are not likely to be large enough to adversely affect the rebuilding plan.

If this program was not adopted, it will have little impact on fishing mortality. It is likely that the winter flounder that could be landed under this program would be caught and discarded, with the result fishing mortality for this stock would be similar to that expected under the program.

Winter Flounder Discarded								
Qtr 1								
Fluke Retained	0	1-100	101-200	201-300	301-500	501-1000	1001-5000	
1-100	26	1	0	0	0	0	0	27
101-500	13	0	0	0	0	0	0	13
501-1000	2	0	0	0	0	0	0	2
1001-5000	3	0	0	0	0	0	0	3
Over 5000	16	0	0	0	0	0	0	16
Qtr 2								
1-100	37	1	1	0	0	0	0	39
101-500	27	2	1	0	0	0	0	30
501-1000	4	1	0	0	0	0	0	5
1001-5000	0	0	0	0	0	0	0	0
Over 5000	0	0	0	0	0	0	0	0
Qtr3								
1-100	36	3	0	1				40
101-500	11	0	0	0	0	0	0	11
501-1000	4	0	1	0	0	0	0	5
1001-5000	5	1	0	0	0	0	0	6
Over 5000	0	0	0	0	0	0	0	0

Winter Flounder Retained								
Qtr 1								
Fluke Retained	0	1-100	101-200	201-300	301-500	501-1000	1001-5000	
1-100	27	0	0	0	0	0	0	27
101-500	13	0	0	0	0	0	0	13
501-1000	2	0	0	0	0	0	0	2
1001-5000	3	0	0	0	0	0	0	3
Over 5000	16	0	0	0	0	0	0	16
Qtr 2								
1-100	39	0	0	0	0	0	0	39
101-500	30	0	0	0	0	0	0	30
501-1000	4	0	1	0	0	0	0	5
1001-5000	0	0	0	0	0	0	0	0
Over 5000	0	0	0	0	0	0	0	0
Qtr3								
1-100	39	1	0	0	0	0	0	40
101-500	9	0	0	1	1	0	0	11
501-1000	3	0	1	0	1	0	0	5
1001-5000	6	0	0	0	0	0	0	6
Over 5000	0	0	0	0	0	0	0	0

Table 56 - Number of observed trips landing fluke and retaining or discarding winter flounder, 2001 - January, 2003

Jan -Apr								
Fluke	0	1-100	101-200	201-300	301-500	501-1000	>1000	Total
1-100	18	9	3	9	15	11	14	79
101-200	14	3	1	0	2	3	5	28
201-500	17	7	0	0	1	0	1	26
501-1000	10	4	0	0	0	0	0	14
1001-2000	27	5	0	0	0	0	0	32
>2000	428	4	1	0	0	0	0	433
May-Aug								
Fluke	0	1-100	101-200	201-300	301-500	501-1000	>1000	
1-100	117	15	10	16	15	17	21	211
101-200	35	0	0	2	2	1	5	45
201-500	420	17	15	5	4	2	3	466
501-1000	19	6	0	0	0	0	0	25
1001-2000	1	2	0	0	0	0	0	3
>2000	2	0	0	0	0	0	0	2
Sept-Dec.								
Fluke	0	1-100	101-200	201-300	301-500	501-1000	>1000	
1-100	71	6	6	6	10	12	13	124
101-200	33	4	3	4	4	0	1	49
201-500	44	2	1	5	8	1	0	61
501-1000	204	28	13	9	5	7	4	270
1001-2000	16	0	0	0	0	0	0	16
>2000	297	0	0	0	1	0	0	298

Table 57 – Number of trips landing fluke and winter flounder using fluke mesh, calendar year 2001

Jan -Apr								
Fluke	0	1-100	101-200	201-300	301-500	501-1000	>1000	Total
1-100	78	1	0	0	0	0	0	79
101-200	28	0	0	0	0	0	0	28
201-500	26	0	0	0	0	0	0	26
501-1000	14	0	0	0	0	0	0	14
1001-2000	32	0	0	0	0	0	0	32
>2000	433	0	0	0	0	0	0	433
May-Aug								
Fluke	0	1-100	101-200	201-300	301-500	501-1000	>1000	
1-100	208	3	0	0	0	0	0	211
101-200	45	0	0	0	0	0	0	45
201-500	466	0	0	0	0	0	0	466
501-1000	25	0	0	0	0	0	0	25
1001-2000	3	0	0	0	0	0	0	3
>2000	2	0	0	0	0	0	0	2
Sept-Dec.								
Fluke	0	1-100	101-200	201-300	301-500	501-1000	>1000	
1-100	123	1	0	0	0	0	0	124
101-200	49	0	0	0	0	0	0	49
201-500	61	0	0	0	0	0	0	61
501-1000	270	0	0	0	0	0	0	270
1001-2000	16	0	0	0	0	0	0	16
>2000	298	0	0	0	0	0	0	298

Table 58 – Number of trips landing fluke and discarding winter flounder, calendar year 2001

5.2.4.6.3 US/CA Resource Sharing Understanding Special Access Program

The US/CA Resource Sharing Understanding Special Access Program is designed to facilitate catching GB yellowtail flounder and GB haddock. GB yellowtail flounder will be primarily caught in the southern section of CA II, and the biological impacts are described in section 5.2.4.6.1. This proposal would allow fishing in the northern part of CA II for two to ten months in order to facilitate catching the GB haddock TAC. There are options for changes to other management measures as well, such as allowing a smaller minimum mesh size or crediting vessels for time spent transiting to and/or from the area. Other stocks that may be caught include GB cod, GB winter flounder, several species of skates, and scallops. Impacts on cod and haddock are described in this section, while likely impacts on skate species are described in the section on bycatch (see section 5.2.8). Scallop impacts are expected to be minimal since there are few scallops in the deeper water targeted by haddock fishermen.

Fishing for GB haddock is subject to a formal rebuilding program, since that stock was declared overfished and has not yet rebuilt to some estimates of its target biomass. The mortality necessary to rebuild by 2014 is estimated as 0.26 under the adaptive fishing mortality strategy (see section 4.1.2.2). Fishing mortality in 2001 was estimated to be 0.22, suggesting that an eighteen increase in fishing mortality can be accommodated by this stock without exceeding the rebuilding fishing mortality target. Analyses of the management alternatives in this document, however, indicate measures are likely to result in a decrease in GB haddock fishing mortality. Analysis suggests the proposed action may reduce mortality on this stock between 30 and 40 percent. This suggests that increased opportunities can be created without delaying the rebuilding of GB haddock past 2014.

GB haddock is a trans-boundary stock that is also harvested by Canada. The exact proportion allocated to each country may be determined by the US/CA Resource Sharing Understanding that is being considered in this Amendment. The total GB haddock TAC in 2004 is estimated to be 24,885 mt, with the US share assumed to be 10,000 mt. Recent landings of GB haddock are shown in Table 59. For the last four years, U.S. landings have increased an average of 37 percent each year. If this rate of increase continues, U.S. landings in 2004 would approach 11,600 mt. This does not appear likely, given the suite of management measures that are adopted by the proposed action. Indeed, through August 2003, GB haddock landings were about seven percent less than for the same period in calendar year 2002

Catch	1996	1997	1998	1999	2000	2001	2002
U.S.	0.3	0.9	1.8	2.8	3.4	4.6	6.4
Canada	3.6	2.6	3.4	3.7	5.4	6.7	6.5
Total	3.9	3.5	5.2	6.5	8.8	11.3	12.9

Table 59 – US and Canadian GB haddock landings, thousands of metric tons. (Source: GARM 2002, U.S. 2002 catch NMFS preliminary landing estimates)

Whether or not this SAP has adverse biological impacts on stocks of GB cod, GB haddock or GB yellowtail flounder depends in part on the implementation of the US/CA Resource Sharing Understanding (see section 3.4.5.3.3). Hard TACs are used to monitor catches on eastern GB, and the SAP, if adequately monitored, should not increase fishing mortality for eastern GB portions of these stocks above acceptable limits.

Vessels will not be charged any DAS for transit to and from the area, and may use either an A or B DAS while fishing in the area. This is in effect an increase in DAS for those vessels that choose to participate with no limit on where the additional DAS can be used. There is a possibility that these DAS could be used to target other stocks that cannot withstand additional fishing pressure.

Of the stocks in this area, GB cod and plaice are targeted for reduced fishing mortality in this Amendment in order to achieve M-S Act objectives. There is no recent information available on catch rates of groundfish or other species inside CAII. Available information for the area immediately outside of the area suggests that cod and haddock are often caught on the same tows. VTR records for trawl trips in statistical area 561 (adjacent to the northern boundary of CAII) for 1999 – 2001 show that for most months, trips reported landing more cod than haddock (ratios are shown in Table 59 below). This information, however, is on a per trip basis and may not reflect the ability of a vessel to target cod or haddock on specific tows. There does not appear to be a clear seasonal pattern, but this could be obscured by changing haddock trip limits. Calendar year 2002 observer data in statistical area 561 documented 159 trawl tows that caught cod or haddock. 155 of these tows landed cod, and 84 landed haddock. The average catch of haddock for those 84 tows was 193 pounds, and the average cod catch for those same tows was 190 pounds. Only four tows that caught haddock did not catch cod. Few tows caught cod, haddock and plaice, and the plaice catches were all less than 50 pounds. Finally, a preliminary report from an SMAST trawl study (Rothschild and Brown 2002) plotted CPUE for by species for each tow. Cod, plaice and haddock all show high CPUEs near the northern end of CAII, but these charts are for all tows and do not take into account seasonal differences (see Figure 115, Figure 116, and Figure 117).

If catch composition inside CAII is similar to that in statistical area 561, vessels taking advantage of this program are likely to catch cod and haddock on the same tow. If a hard TAC is imposed on the fishery, the TAC should prevent the SAP from raising fishing mortality to unacceptable levels. In the absence of a TAC, if this program is adopted with effort incentives (such as DAS credits, credits for steaming time, etc.) it may raise fishing mortality on GB cod unless vessels can avoid cod through selective fishing practices or gear modifications (such as a separator trawl) are required to fish inside the area. While plaice CPUEs are high outside CAII, it appears from the limited observer data that plaice is only rarely caught with cod and haddock on the same tow. Another groundfish stock that may be caught by vessels fishing in this program include GB winter flounder, but this is less of a concern because the stock was above its target biomass in and fishing mortality was less than F_{MSY} in 2001.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1999			8.2	7.1	4.2	4.2	9.1				0.9	50.5
2000			4.9	4.6	13.0	1.8	3.9	61.6				8.1
2001	3.0	1.7	0.8	5.1	2.9	2.5	2.3	7.2		0.2	2.1	7.8

Table 60 – Ratio of cod/haddock landings by trawl vessels fishing in statistical area 561, calendar year 1999 – 2000, as reported on VTRs.

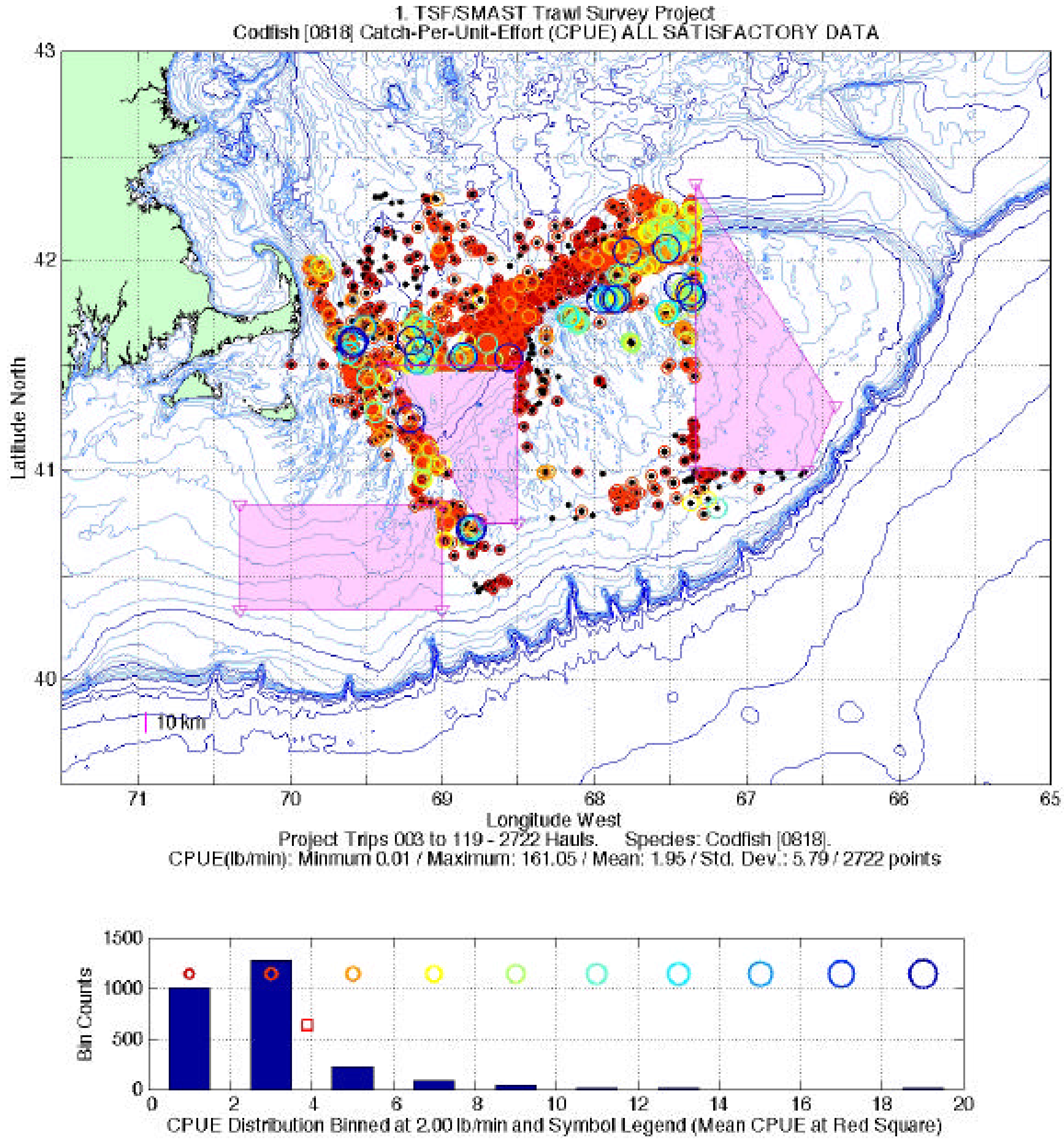


Figure 115 – Observed Cod CPUE from TSF/SMAST Trawl Survey Project (from Rothschild and Brown 2002)

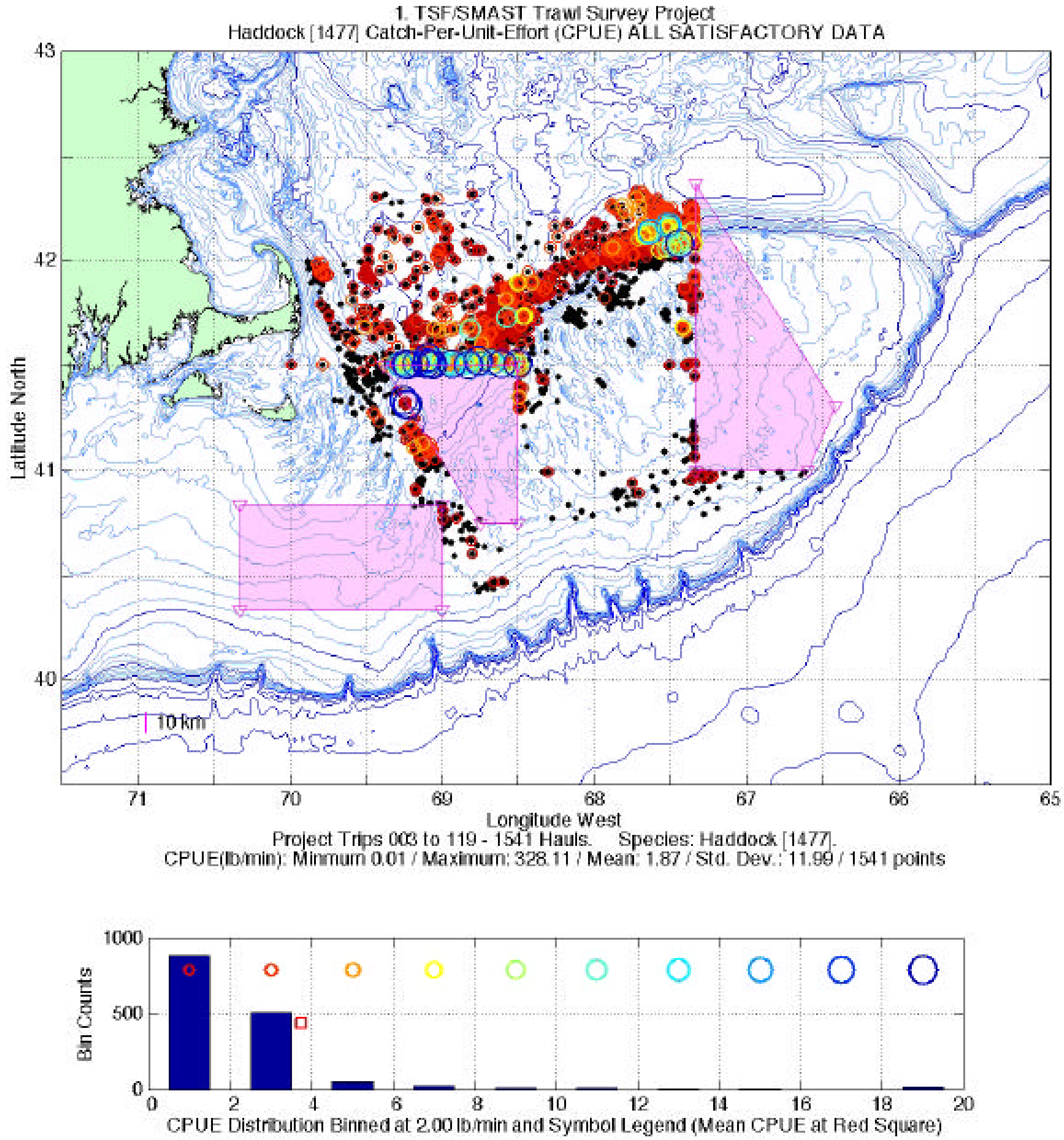


Figure 116 – Observed haddock CPUE from TSF/SMAST Trawl Survey Project (from Rothschild and Brown 2002)

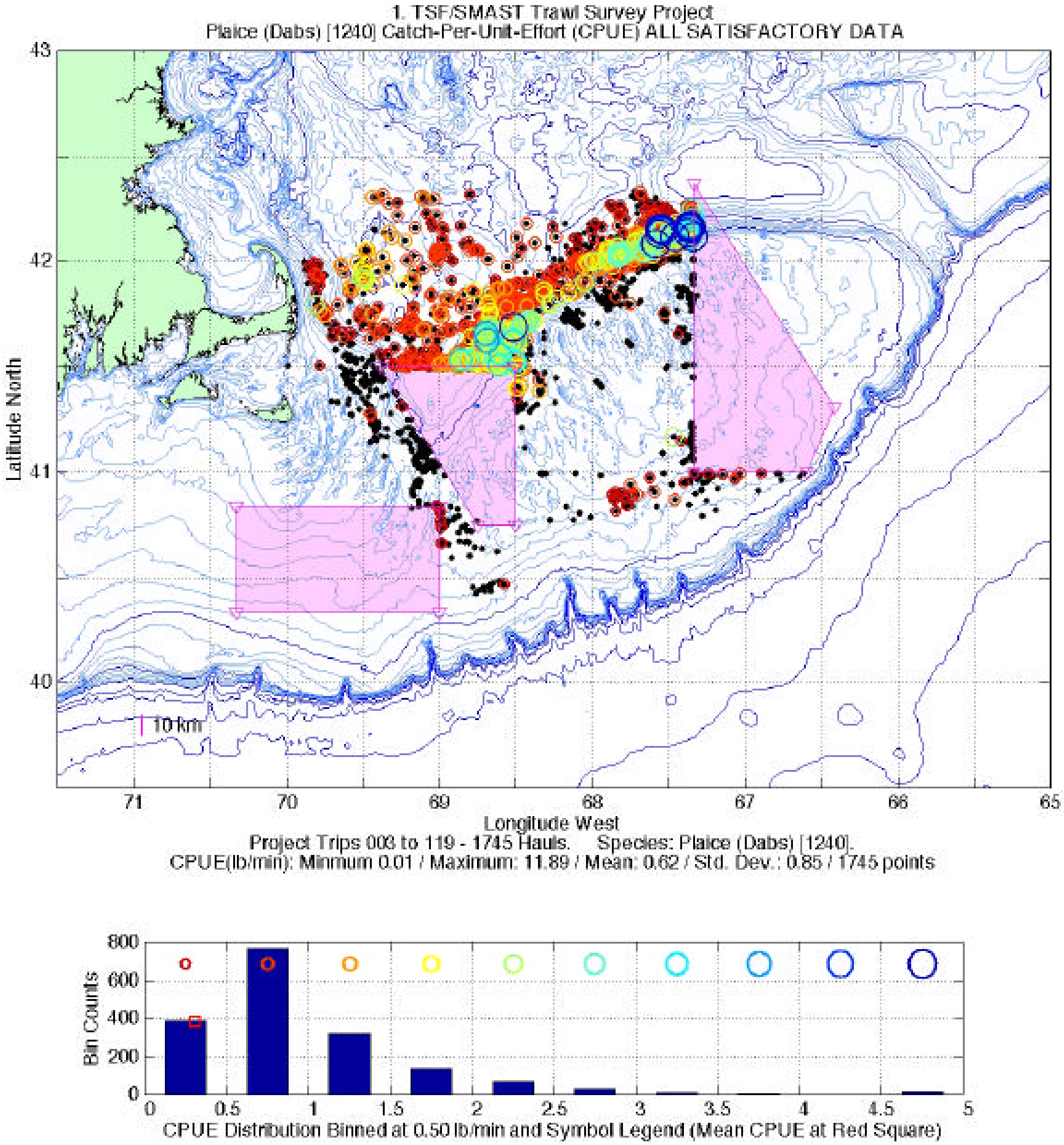


Figure 117 – Observed plaice CPUE from TSF/SMAST Trawl Survey Project (from Rothschild and Brown 2002)

5.2.4.6.4 Hook Gear Closed Area I Special Access Program

This program will allow hook vessels to target haddock in Closed Area I. An experimental fishery is currently being conducted in this area. Data from that experiment are not available so it is not possible to estimate biological impacts. In general, if the experiment demonstrates that haddock can be caught without catching significant amounts of cod or other stocks in need of a mortality reduction, then the program should not increase cod mortality. The proposed program includes a cod TAC of 35 mt, which is less than one percent of the overall GB cod target TAC (including Canadian share) for calendar year 2004. The analysis of the overall management program shows that fishing mortality on haddock is expected to decline by thirty to forty percent. Since haddock fishing mortality is already less than the mortality needed for the adaptive strategy, catches from this hook gear SAP are not likely to threaten the rebuilding program.

5.2.4.7 Closed Area Administration

5.2.4.7.1 Rationale for Closed Areas

The proposed action required that any action that adopts a new closed area specifically identify the rational for the area and what vessels (if any) will be allowed to fish in the area. Clarifying the rationale for closed areas will allow the Council to more accurately assess whether the current utility of the closed areas are meeting the conservation goals for which they were established. This will enable the Council to make adjustments to the closed areas to sustain their effectiveness. A simple documentation for rationale for closed areas will not have an effect on stocks or rebuilding programs, although the later use of this information in a review of closed areas may have positive consequences for stocks that are protected by closed areas.

If the rationale for closed areas is not specified because this measure was not adopted, future changes to closed areas may prove difficult because it will not be clear what the objectives are and how success should be measured.

5.2.4.7.2 Access to Closed Areas

Options 1, 2, 3 and 4 may reduce the effectiveness of closed areas for protecting habitat and stocks because of the minimal levels of bycatch incurred by exempted gears. However, Options 2, 3 and 4 may focus protection of closed areas on targeted species while reducing impacts on other fisheries. Option 5 prevents any access to closed areas, maximizing their effectiveness and simplifying enforcement. It is expected to have the most positive biological effects of any of the closed area access options. The no action alternative will not have any additional impacts on fishing mortality.

None of these alternatives are part of the proposed action.

5.2.4.7.3 Review of Closed Areas

This measure was not selected. It would have established a formal schedule to review closed areas on a regular basis, insuring that they continue to achieve the goals of the FMP. This review would also have served an indicator of whether a particular closed area is serving the purpose for which it was established and if not, determine the nature of its current utility. It may allow the Council to improve the benefits afforded to stocks and habitat by modifying closed areas. The no action alternative will prevent a scheduled, periodic review of closed areas and benefits that accrue may suffer as a result. For example, areas designed to reduce fishing mortality may not be effective and that will not be examined on a regular basis.

5.2.4.7.4 FAAS

The proposed action to eliminate the FAAS will have no biological impacts since the existing system has never been used successfully. The FAAS concept was intended to provide a means for quickly implementing a closure in response to short-term resource conditions (e.g. the presence of a large number of juvenile fish). The system proved unworkable, in part because the regulatory requirements for implementing a closure delayed implementation. The no action alternative will have no impact on fishing mortality because the system has never been used.

5.2.4.8 Leasing of DAS

DAS leasing alternatives are intended to provide increased opportunities to the fishery participants for diversification into other fisheries and greater economic flexibility without having adverse impacts on the stocks. DAS leasing is an economic measure. If the number of allocated DAS are limited to the appropriate level for the targeted fishing mortality rate, leasing of DAS should have a negligible effect on fishing mortality. If the total number of DAS allocated is not controlled, leasing may result in an increase in effort as unused DAS are leased to vessels that are actively fishing, increasing fishing effort and thus fishing mortality. Because the number or type of vessels which may use a leasing program is unknown, it is not possible to predict how leasing may alter DAS use or fishing behavior. However, if a large number of DAS are leased from vessels in one area to vessels in another area or from vessels targeting one stock to those targeting a different stock, the leasing program may result in a shift in fishing effort. Shifts into an area with stocks in need of additional protection could result in increased mortality and could slow rebuilding programs. Once again, if the allocated DAS are appropriately determined and adjusted for such shifts, the leasing program would not result in changes in fishing mortality.

The proposed action relies on days at sea as the primary management tool. As a result of large reductions in days at sea, mortality on key stocks is expected to decline. This will occur even if more productive vessels lease days at sea from less productive vessels. The proposed action allocates more Category A DAS than the target number of used DAS. It is at least theoretically possible that as a result of DAS leasing, all allocated Category A DAS will be used. Analysis of the biological impacts of the plan suggest that if the number of Category A DAS used exceeds 95 percent, biological objectives may not be met for some stocks.

The approved DAS leasing alternative includes the following specifications:

- Term of Lease: DAS would be leased for only one fishing year.
- Vessels may lease DAS from more than one other vessel (conversely vessels may lease DAS to more than one vessel) subject to conservation equivalency provisions.
- DAS may be leased on a unit basis where a unit is defined as being 1 DAS or 24 hour increment.
- Leases are not subject to a "conservation tax."
- Vessels may renew leased DAS on an annual (fishing year) basis.
- Leased DAS must be used in the same fishing year they are acquired.
- Leased DAS may not be used as part of any carry-over.
- DAS available for leasing shall be limited to only Category A DAS; DAS that may be immediately available for use.
- Lease agreements must be registered with the NERO. Administrative process based on two possible approaches 1) internal administration by NERO or 2) external administration by approved "brokers" (for example, permit brokers could be sanctioned by NERO to document exchanges and provide data to NERO for monitoring and enforcement purposes) to be developed.
- Permit History: the lease agreement must clearly state which permit retains the history of the leased DAS
- Provisions for Size: A lessor may not lease DAS to any vessel with a main engine horsepower rating that is 20% more than that of the lessee and may not lease DAS to any vessel that is 10% more than that of the lessee's vessel's LOA.
- DAS cannot be sub-leased
- A vessel can lease the number of DAS equal to its allocation for fishing year 2001 (not including carry-over DAS).

- If a vessel does not use all the DAS that are allocated to it and that it leases, the Leased DAS are considered used first for the purposes of permit history
- The leasing program will expire in two years unless extended by Council action

DAS leasing may be expected to impact mortality rates in three ways. First, it could increase the number of DAS used, reducing the difference between allocated and used DAS. Second, it could increase the overall efficiency of the used DAS through the leasing of DAS from less efficient to more efficient vessels. Third, it could result in used DAS shifting geographically with the potential for proportionally increased pressure on certain stocks.

DAS use

Based on recent trends, Category A DAS use is expected to range from 78 percent to 85% of allocated DAS, or roughly 31,000 to 35,000 used DAS out of 41,000 allocated. The model used to quantify possible economic impacts of DAS leasing predicted a 98-99 percent utilization rate. *This is not intended to be an accurate prediction of DAS utilization under leasing, but is an absolute upper bound on the number of DAS that could be used under a leasing program.* The model used in that analysis is a fleet optimization model that attempts to extract the highest overall fleet revenue via DAS leasing. By definition, all vessels will either fish or lease their DAS under this model--the only vessels that do not (who possess 0.5-1.5 percent of allocated DAS) are those whose predicted revenue falls short of predicted variable costs and who cannot find a more profitable lessee for their DAS. The model also assumes no transaction costs, perfect information and communication, and instantaneous lease trades, each taking place under the most profitable terms. The salient point is that, under the model, vessels expected to clear any profit at all by either fishing or leasing will do so. Historical trends in DAS utilization indicate that this is simply not the case in reality--many trades or fishing days may clear so little profit as to make the effort undesirable. Many vessel owners may choose to not fish and not lease, an outcome that the optimization model cannot accommodate but one that fisherman have shown through their behavior is not unlikely. Furthermore, perfect information, communication, and instantaneous transfers are not realistic assumptions, and there are likely to be transaction costs of some magnitude associated with trades.

Another potentially mitigating factor is DAS carryover. Any category A DAS that are not used in FY 2004 may be carried over to FY 2005 (up to 10 DAS). In calendar year 2002, 991 vessels that used DAS carried over 9,132 DAS, for an average of 9.2 DAS per vessel. We can assume that vessel owners who elect to lease DAS will keep a very small number, if any, of DAS available for carryover in FY 2005. But those vessel owners who do elect to fish will likely keep some DAS for carryover if recent history is any guide. In effect, vessel owners may conclude that it is more profitable to use those DAS in the following fishing year than to use or lease them in the current fishing year. The total amount of DAS carried over into FY 2005 will have a significant impact on the DAS utilization rate in FY 2004. The following three graphs show the anticipated maximum DAS utilization rate achievable if a certain number of DAS per vessel fishing is not fished in FY 2004 (i.e. reserved for carryover). The three tables are based on three estimates of the number of vessels fishing in FY 2004: the model-predicted number (approximately 500), all vessels with DAS allocations (approximately 1,000) and a median estimate (approximately 750).

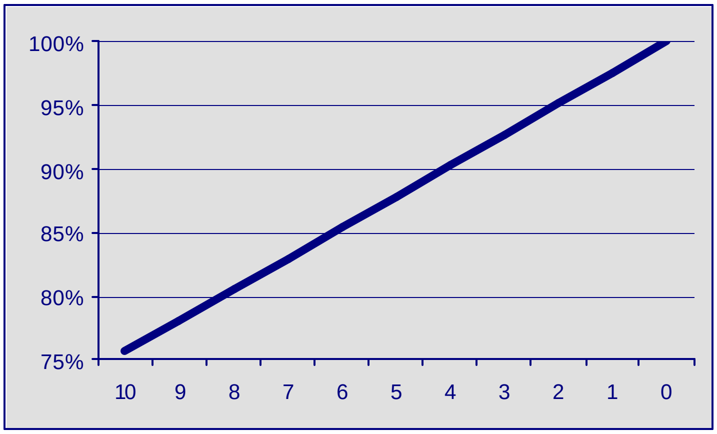


Figure 118 - Maximum potential DAS utilization for a given fleet-wide average number of carryover DAS (on X axis), assuming a 1000 vessel fleet.

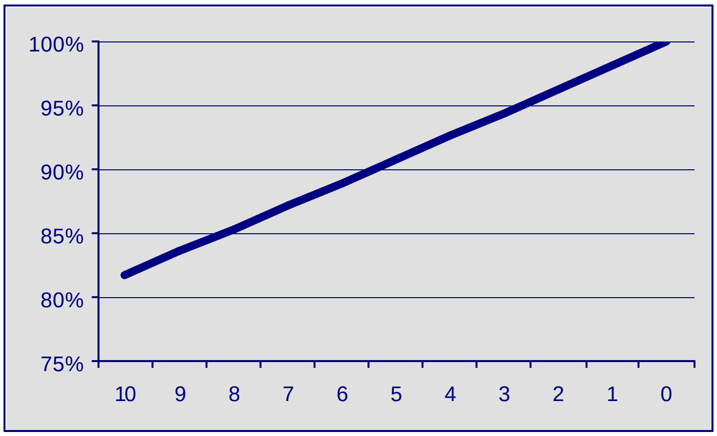


Figure 119 - Maximum potential DAS utilization for a given fleet-wide average number of carryover DAS (on X axis), assuming a 750 vessel fleet.

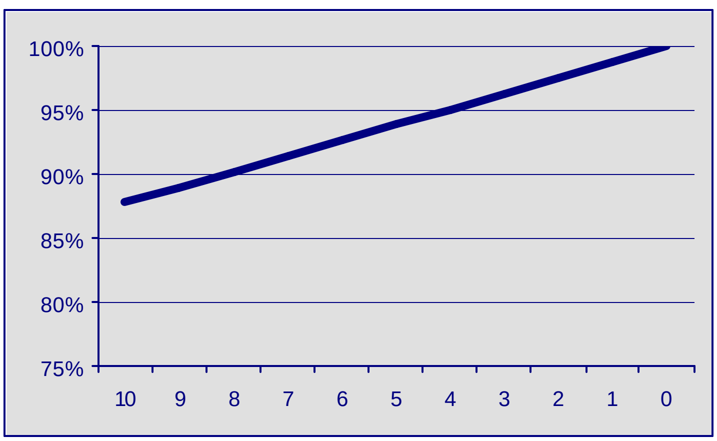


Figure 120 - Maximum potential DAS utilization for a given fleet-wide average number of carryover DAS (on X axis), assuming a 500 vessel fleet.

Figure 118, Figure 119 and Figure 120 show that, depending on what amount of carryover occurs, maximum potential DAS utilization is likely to be well below 100%. If the DAS leasing program is widely subscribed, and results in a dramatic reduction in the number of vessels fishing, then the DAS set aside for carryover will have a less significant effect on overall DAS utilization; conversely, if the program is moderately or lightly used, the number of DAS vessels are likely to carryover will result in a maximum potential use rate significantly lower than 100%.

Increasing fleet efficiency
The shift of DAS from less to more efficient vessels is likely to take place under leasing. However, due to the limited ability for DAS to flow from vessels with lower catching power to vessels with higher catching power, the leasing model shows that leased DAS tend to flow from larger to smaller vessels. In aggregate, this is likely to mitigate any potential increase in fishing mortality for a given number of used DAS.

Geographic effort shifts
The DAS leasing model shows that leased days will flow from the southern and northern portions of the fishery into the more central areas, particularly Massachusetts. This could result in increased pressure on stocks such as GB cod, plaice, and CC/GOM yellowtail flounder. However, due to the trip limits on two of those three stocks, and the overall health of other centrally located stocks such as GB haddock and GB yellowtail flounder, it would be difficult to conclude that this geographic shift in effort would have an adverse impact on stocks of concern.

Additional factors
The permit transfer option (Capacity Reduction Option 3) will also have an impact on leasing and DAS utilization, though not on the utilization rate *per se*. If a substantial number of vessels chose to participate in this program, it will reduce the allocated DAS pool due to the 40% conservation tax. DAS acquired through this program would reduce the DAS available for leasing; there is, therefore, a linear relationship between the number of permits transferred and the reduced potential adverse impact of DAS leasing on target fishing mortality rates. Economic impacts analysis of this alternative shows that a substantial number of DAS (a range of anywhere from 1,000 - 7,500 DAS) may become subject to the 40% conservation tax, which would reduce the allocated DAS pool substantially.

The impacts of these changes can only be discussed qualitatively. If DAS flow to smaller vessels, overall catch rates may decline. This would also be expected to shift effort away from offshore stocks and to inshore stocks. While this would benefit stocks such as GB cod, SNE/MA yellowtail flounder, and white hake, it may increase mortality on stocks such as GOM cod, plaice, and CC/GOM yellowtail flounder. The DAS leasing program will need to be carefully monitored to ensure it does not compromise rebuilding programs. For that reason, the Council has proposed a two year sunset provision.

5.2.4.9 Recreational Fishing Permit

The proposed action does not adopt a recreational fishing permit. Option 1 is no action (no recreational fishing permit). Options 2, 3 and 4 require that a recreational vessel has a permit in order to fish for or possess groundfish. These measures will allow for better data collection about recreational catches and may lead to improved scientific information about fishing behavior and fishing mortality. These measures have no direct biological impacts on groundfish stocks but provide important information about stocks which may lead to better management of the groundfish fishery and closer adherence to rebuilding programs designed to achieve biological targets.

5.2.4.10 "Running Clock" Alternatives

The proposed action did not change the administration of the "running clock." Option 1 (no action) maintains the current modified running clock system and will not result in any change in fishing mortality. Options 2 and 3, which allow a vessel to exceed its daily trip limit, may serve to reduce discards by charging the vessel in DAS to account for the overage. These options promote efficiency without increasing fishing effort. They are likely to have minor positive effects (that is, reduced fishing mortality from lower discards) on the resources that have a trip limit. This is because vessels may choose to end a trip and land the catch under a running clock, rather than continue to fish for other species (not managed by a trip limit) and discard more fish that are limited by a trip/possession limit.

5.2.4.11 Observer Coverage

Observer coverage, like recreational fishing permit requirements, will allow for enhanced data collection about the targeted stocks. Specifically, it will yield important information about the level and species composition of discards. This data may become a means for better estimating stock abundance and take bycatch level into account when establishing measures to achieve rebuilding requirements in the future.

The Council does not control the observer program. The proposed action states the Council's desire for an acceptable level of observer coverage to monitor this fishery.

5.2.4.12 VMS Requirements

VMS is an informational tool which will allow for better enforcement of closed areas and improved information about the fishing patterns of vessels in the northeast groundfish fishery. VMS will not have any direct impacts on the fishery resource, though it may indirectly benefit stocks by improving data quality and management based on these data.

The proposed action allows a vessel that is using a VMS to stop transmitting when not participating in any fishery. This will not have any biological impacts.

5.2.4.13 Day Gillnet Block Out of the Fishery

The proposed action did not change the requirements for day gillnet vessels to take blocks of time out of the fishery. These requirements were originally adopted as part of a package of measures designed to reduce fishing effort by the gillnet fleet, Framework 20 (implemented May 1, 1997) defined day trip gillnet vessels and required them to take 120 days out of the gillnet fishery during the fishing year. The blocks of time out must be a minimum of seven days in length. The 20 day spawning block counts towards this requirement. In addition, day trip gillnet vessels must take 21 days out of the fishery between June 1 and September 30 each year. These vessels are allowed to fish for groundfish with other gear while taking a block out of the gillnet fishery.

This requirement (along with the 15 hour day gillnet minimum and limits on the number of nets) was established because the effectiveness of the Amendment 7 effort reduction program for day gillnet vessels was questioned for two reasons: gillnet vessels were theoretically able to make 140-176 trips by fishing for 12-15 hours (with 88 allocated DAS), and they generally leave their gear to soak overnight or longer. In theory, without extending soak time, a day gillnet vessel could have its gear in the water a minimum of 176 days based on daily trips of 12 hours. This implies that under the 50% effort reduction program adopted in Amendment 5, the baseline for these vessels was to soak gear every day of the year.

The block out requirement was implemented to reduce the possibility gillnet vessels could compensate for other effort reduction measures by extending soak time between trips. The requirement to take time out during the summer months was intended to apply the time out requirement when gillnet activity is highest. Allowing the vessels to take blocks out when they do not normally fish would not have a conservation benefit.

The 120 days out requirement reduces the number of days available to day gillnet vessels to soak their gear by 33% (to 245 days). The impact on actual fishing practices is not clear. By lengthening the time between trips, a fisherman can use the same amount of soak time but fewer DAS. At some point, however, there are tradeoffs between the quality of fish landed, impact of trip limits (fewer trips results in less fish landed under a trip limit), and other factors that restrict a fisherman's ability to use fewer DAS while maximizing soak time. Based on an average soak time of 1.5 days, a gillnet vessel could, in theory, make 163 trips if it was able to fish every available day (discounting weather, unplanned vessel maintenance, seasonal closures, etc.). Assuming an average soak time of 2 days reduces the number of possible trips to 122.5. While it may be possible to increase the number of theoretical trips by changing fishing practices – shortening soak time, for example - since each day gillnet trip counts a minimum of 15 hours, the maximum number of trips is 140 for a fleet DAS vessel that is allocated 88 DAS.

For the June-September period, the requirement to take 21 days out of the fishery reduces the number of available days that gear can be soaked by 17% (to 101 days). As noted above, the impact on actual fishing practices is not clear. Based on an average soak time of 1.5 days, a gillnet vessel could, in theory, make 67 trips during this period, using a minimum of 41.8 DAS (15 hour minimum for day gillnet vessels, discounting weather, unplanned vessel maintenance, seasonal closures, etc.). An average soak time of 2 days results in 50.5 trips, using 31.5 DAS. (As noted above, it may be possible to increase the number of trips by changing fishing practices). Without the block out requirement, a day gillnet vessel could theoretically take between 61 (2 day soak) and 81 (1.5 day soak) trips, using a minimum of 38.1 to 50.6 DAS, during the months of June through September.

These analyses, however, do not account for the additional DAS reductions proposed under this Amendment. With reduced DAS allocations, the blocks-of-time out of the fishery become less effective at reducing fishing activity. For example, a gillnet vessel with 70 allocated DAS under the FW court order can only take a maximum of 112 fifteen hour trips during the course of the year.

Removing the 21 - day gillnet block out of the fishery (Option 2) may increase gillnet fishing effort during the summer months. The number of trips that could theoretically be taken by a vessel (absent weather, market, vessel repair, or other concerns) could increase about 20 percent, from 67 to 81. This will only result in increased fishing mortality on a stock if this is additional effort, or is effort shifted from a less-productive time of the year. About 60 percent of day gillnet vessels currently take less than 60 trips during the summer months. This suggests that there are other factors besides the block-out requirement that limit the number of trips. Since this measure does not change those factors, any increased fishing mortality that results from removing this requirement is likely to be small.

Removing the 120-day blocks out of the fishery is not likely to affect fishing mortality if DAS allocations are the same, or less than, the allocations under the FW 33 court order. The maximum number of trips a day gillnet vessel can make if allocated 70 DAS or less is 112 fifteen hour trips. With a soak time of 1.5 hours, and the 120-day block requirement, a gillnet vessel could theoretically make 163 trips if not constrained by DAS. The limiting factor is thus the DAS allocation and not the number of days available after the block out limitation is applied.

The proposed action is the no action alternative. It will not affect fishing mortality. Rebuilding alternatives implicitly included this option when designed to meet the mortality objectives. This is because in evaluating the alternatives in the closed area model, fishing activity in the model reflects the regulations in place during the period 1998 through 2001 – including the requirement for day gillnet vessels to take blocks of time out of the fishery.

5.2.4.14 DAS Counting

The proposed action does not change the way DAS are counted. The no action alternative will not affect fishing mortality. Rebuilding alternatives were designed and evaluated using the no action alternative for DAS counting.

Changing the way in which DAS are counted, instituting a 15-hour minimum for trips over 3 hours for all vessels in Option 2 and a 24-hour minimum for trips over 3 hours for all vessels in Option 3, may have a slight positive impact on stocks because DAS will be most likely be used up faster with no increase in fishing intensity or overall effort. This may have negative implications for data quality, however. One used DAS as reported under Option 3 does not necessarily represent 24 hours of fishing. The vessel may have fished any length of time between 3 and 24 hours. This makes it more difficult to associate time fishing with the amount of fish harvested. This could impede the ability to analyze the impacts of management alternatives in which DAS are used as a tool to control effort. While this has no direct impacts on mortality, it may adversely affect the precision with which stocks may be managed.

5.2.4.15 Reporting Requirements

The proposed action will implement electronic reporting for dealers and, in the future, electronic reporting for vessels. All of the reporting options will serve to enhance the speed at which fishery-dependent data is processed and stored. This has no direct biological effects but it may indirectly benefit stocks by improving data quality and management based on these data. For those stocks managed by a hard TAC (portions of the GB cod and haddock stocks and the GB yellowtail flounder TAC), electronic reporting will reduce the possibility that landings information will lag behind catches and result in the fishery exceeding the TAC.

5.2.4.16 Hand Gear-Only Permit Alternatives

As noted in section 5.4.9.2.15, very few vessels landing cod, haddock and pollock are associated with open access hand gear only permits (184 permits in 2000). The number of such permit holders landing 500 pounds or more of cod, haddock and pollock is even fewer (65 in 2000). In 2000, all open access vessels landed a total of 868,000 pounds of groundfish. Therefore, the effect that hand-gear vessels in the open access permit category have on fishing mortality of groundfish stocks is minimal. It should be noted, however, that activity by all open access vessels has nearly quadrupled since 1996. Under the no action alternative, this increase would likely continue and could be a future concern. Providing a limited access permit option for hand gear only vessels addresses the potential problem of rapid expansion of the hand-gear fishery by controlling participation.

5.2.4.17 Inshore Gulf of Maine Conservation and Stewardship Plan

The proposed action does not adopt the Inshore Gulf of Maine Conservation and Stewardship plan. This alternative only describes management measures for the Gulf of Maine, with a focus on the inshore areas. As a result, it cannot be adopted as a stand-alone alternative but must be adopted in concert with one of the other alternatives. Biological impacts cannot be analyzed using the Closed Area Model because this model cannot be applied to only one area. This alternative could be implemented with any of the options that use hard TACs to insure biological objectives are met. For example, it could be incorporated into the area management approach proposed in Alternative 4 and could be the specific measures that are adopted in the Gulf of Maine. It could also be adopted with the hard TAC alternative, with the measures proposed replacing or supplementing the measures implemented August 1, 2002 in the Gulf of Maine, or with Alternative 3 (area management) – once again, replacing measures that are proposed in that alternative for the inshore GOM. In these examples, the use of a hard TAC means that the biological objectives will be met, and the measures then take the form of measures implemented to extend the season. Incorporating this alternative into the two alternatives that rely on effort controls (Alternatives 1 and 2) is more problematic. In order to determine if biological objectives are met in these examples, the precise description of all the measures adopted would have to be modeled and a determination made as to whether the goals of the amendment would be met. This has not been done, since the Council has not defined how, or if, it will incorporate the measures proposed in Alternative 5 with either of those two alternatives.

Many of the measures proposed in this alternative can be evaluated qualitatively to determine if they are likely to increase or decrease mortality compared to the no action alternative. This alternative attempts to provide a closer link between an understanding of the resources in the area and the tools used to manage the resources. A discussion of the biological rationale for these measures is included in Appendix XIII. This section will examine the individual measures and describe the expected impacts.

5.2.4.17.1 Fishing Year

The fishing years will begin on July 1. While this may not have direct impacts on fishing mortality, as discussed in section 5.2.4.1 the change may reduce mortality in the short term. New DAS allocations are effective at the start of the fishing year. By moving the start of the year away from the period of aggregations of fish in the inshore GOM, there will be less of an incentive for vessels to use a large number of DAS early in the fishing year, during times of high catch rates. This impact may be temporary, as vessel operators will probably adjust their fishing plans to reserve DAS for fishing during periods the fish are aggregated.

5.2.4.17.2 Possession/Trip Limit

The GOM cod possession/tip limit is increased to 600 pounds. In general, an increase in a trip limit will result in increased mortality. From an economic standpoint, more trips become profitable and thus more cod is landed. The increase in the trip limit, however, also reduces the amount of discards, so this measure will reduce discards of GOM cod. If the increase in the trip limit is enough to encourage vessels to end their trips earlier, the result may be reduced total catch and a reduction in mortality. It is not possible to quantitatively estimate the impacts of this measure.

5.2.4.17.3 Effort Controls

The alternative proposes using the DAS allocated to vessels on August 1, 2002, with the exception that all vessels will receive a minimum of 25 DAS. The total number of DAS that will be allocated to the fishery will be greater than the number used in fishing year 2001. It is likely, however, that this allocation will result in some reductions in DAS used. Fishing year 2002 allocations are higher than the DAS used in 2001, yet actual DAS use through October is roughly 60 percent of the amount used in 2001. This suggests that the distribution of DAS may impact how many DAS are used. While this alternative does increase the minimum number of DAS issued to vessels, it will probably still result in a reduction in DAS used compared to 2001. It is not possible to predict the exact level of DAS use that will result. This measure may reduce fishing mortality on stocks in all areas, not just the GOM.

5.2.4.17.4 Observer Coverage

While an increase in observer coverage to 20 percent of all trips will not directly result in a reduction in mortality, it will lead to an improved understanding of discards, fishing effort and fishing practices that will benefit management in the future.

5.2.4.17.5 Gear Restrictions

Trawl Gear

The alternative adopts minimum mesh size of 6.5 inch codends and promotes the use of a composite cod end with square mesh on the top and diamond mesh on the bottom. The impacts of the mesh increase are discussed in section 5.2.6.3.3 and equate to roughly a ten percent change in the reference points.

Experiments with composite codends show improved selection patterns (Glass, pers. comm.) which may increase the benefit that results from the mesh change. The alternative also will gradually reduce the length between trawl doors and the wings of the net. Presumably at least some vessels fishing in the inshore GOM are currently using cable that exceeds the proposed lengths. (VTR information is available for the sweep width of trawls, but not for the distance between the door and the net wing.) Reducing this distance will reduce the area swept by the ground cables of the trawl. Fewer fish should be "herded" into the net, and catches should be reduced as a result. While fishermen could react by increasing time spent fishing, the reduced DAS allocations limit their ability to respond in this fashion. These changes in trawl net configuration should result in reduced catches, but the amount cannot be quantified.

The proposal also includes a ban on night fishing in the inshore GOM. A ban on night fishing may benefit stocks in several ways:

- The ban will prevent trawling for roughly half of each day, reducing the time available to fish and thus providing an additional control on effort.
- If catch rates are lower during the day, limiting fishing to this time period will result in lower catches for a given amount of effort.
- To the extent fishing activity disturbs codfish spawning behavior, a prohibition on night fishing may improve spawning success.

The following analysis focuses on the impacts of a ban on night fishing on cod catches. The ban could increase fishing mortality as well, if it encourages vessels to fish on stocks closer to homeports, resulting in increased pressure inshore, or to target cod rather than stocks that may be caught at night. A ban on night fishing will reduce fishing mortality if part of the cod catch is currently caught at night in one of two ways:

- Day/night catch rates are different, and/or
- Effort catching cod at night is not shifted to daytime fishing.

If there are benefits from this measure, most will be as a result of the impacts on the trawl fishery. Presumably this measure will have little impact on the catches from gillnet and bottom longline vessels. While the ban on night fishing will prevent fixed gear from being set or retrieved during the night, it is allowed to be in the water.

Day/Night Fishing Activity
In order to determine the current extent of night fishing, VTRs were examined for 1999 and 2000 to determine the number of trips that occurred at night and the number that occurred during the day. Trips were first identified that reported fishing in the Gulf of Maine west of 69-55 W, in a GOM statistical area, between January and June. This does not include the entire inshore area proposed in this alternative, but does focus on the area with the highest reported landings of cod and other inshore stocks. Only trips that reported both a departure and arrival time were examined. Because of errors in reporting, this selection process results in a subset of all trips. It is not known if using this subset this introduces a bias into the analysis.

Trips were first sorted to determine if they were one day or less in length (day trips), or more than one day in length (multi-day trips). Since any trip absent more than 24 hours in length must have taken place at least partially at night, trips less than 24 hours in length were examined to determine if the trip included fishing at night. Any day trip (less than 24 hours in length) that departed after 1500 hours was considered to have fished at night; all others were classified as daytime trips. This time was chosen to allow some time for transit from homeport to a fishing area, and also to characterize trips that may depart in the evening and fish until early the next morning as a night fishing trip. The amount of reported landings was recorded for all gear types.

Most trips in this area are day trips (Table 61). In 1999, there were almost ten times as many day trips as multi-day trips for all gears. Bottom longline trips were reported close to this same ratio, while sink gillnet trips were predominantly day trips. For otter trawl vessels, the ratio was slightly less than 10:1. In 2000, the ratio of day trips to multi-day trips apparently declined to about 6:1, but this may be a result of the way data were selected for this analysis. It is still clear that the number of day trips far exceeds the number of multi-day trips in this area. The difference in days absent is not as dramatic. In 1999, slightly fewer than two-thirds of the days absent were on day trips, while in 2000 there 10 percent days absent on multi-day trips.

		All Gears		Otter Trawl		Sink Gillnet		Bottom Longline	
YEAR	**Data**	**Day**	**Multi-Day**	**Day**	**Multi-Day**	**Day**	**Multi-Day**	**Day**	**Multi-Day**
1999	Number of Trips	5,016	502	2,051	386	1,103	50	344	30
	Days Absent	2,281	1,250	1,052	902	510	100	164	101
2000	Number of Trips	2,786	471	1,145	352	669	73	81	32
	Days Absent	1,233	1,354	575	934	306	241	40	106

Table 61 - Number of trips and days absent by length of trip. (Source: VTRs, unpublished data)

Trips less than 24 hours in length were examined to determine whether the trip was likely to include a period of night fishing. If a trip did not take place at night, it was characterized as a daytime trip. As described above, this was estimated by considering any trip that departed after 1500 hours and before midnight as a night trip. This arbitrary categorization may under-estimate the number of night trips if there are many trips that depart after midnight but early enough that fishing begins before dawn. For trips less than 24 hours in length, the overwhelming majority of trips for all gears appear to take place primarily during daylight hours (**Table 62**). Based on the information in **Table 61** and **Table 62**, the benefits from a ban on night fishing will result primarily from the impacts on multi-day trips. It is likely that there will be little benefit from the impact on day trips.

		All Gears		Otter Trawl		Sink Gillnet		Bottom Longline	
YEAR	Data	Daytime	Night	Daytime	Night	Daytime	Night	Daytime	Night
1999	Number of Trips	4,935	81	2,009	42	1,099	4	341	3
	Days Absent	2,239	42	1,020	32	507	3	163	1
2000	Number of Trips	2,720	66	1,088	57	667	2	79	2
	Days Absent	1,196	37	541	34	305	1	39	1

Table 62 - Number of trips less than 24 hours in length categorized as daytime and night fishing trips.

The impacts of this measure depend on how much cod is caught on day trips as opposed to multi-day trips. If a large amount of cod is caught in multi-day trips, then the ban on night fishing should have more impact as at least some portion of that cod is likely to have been caught at night. The amount of cod reported retained was summed for the vessels on multi-day trips. In 1999 and 2000, between 64% and 70% of the cod retained from each year was caught on trips of less than 24 hours in length. For trawl vessels in both years, day trips accounted for slightly less than 60% of the cod retained during both years. Days trips accounted for 87% of cod retained by gillnet vessels in 1999, and 74% retained in 2000. Longline vessels retained 70% of their cod on day trips in 1999 but only 52% on day trips in 2000.

	Cod Reported Retained							
YEAR	All Gears		Otter Trawl		Sink Gillnet		Bottom Longline	
	Day	Multi-Day	Day	Multi-Day	Day	Multi-Day	Day	Multi-Day
1999	513,243	212,703	222,312	162,183	128,334	18,816	38,100	15,885
2000	679,779	379,305	371,874	272,475	206,133	71,769	24,610	22,369

Table 63 - Cod retained by gear and length of trip.
Source: VTRs, unpublished data

Because most trips are less than 24 hours in length, and most of those trips take place during the day, the benefits of this proposed measure will result from changes in catch rate on multi-day trips. Such trips accounted for between 15 to 23% of otter trawl trips in this area in 1999 and 2000. These trips accounted for between 22 and 25 percent of the cod retained in 1999 and 2000 on those trips examined. How much of the cod on those trips was caught at night as opposed to how much was caught during daylight is not known.

Composition of Catch

A ban on night fishing in the area west of 69-55 W could have a negative impact on cod mortality if it shifts effort of multi-day trips away from other species and onto cod. The VTR data were examined to determine if there was a difference in catch composition between day and night fishing trips. Cod was compared to the catch of groundfish, and to the catch of groundfish plus monkfish. The data were calculated based on both landings (Table 64) and catch including discards (Table 65). In both tables, there is essentially no difference in the amount of cod as a percentage of catch for otter trawl vessels in 1999. In 2000, however, there is a small difference between day and multi-day trips for cod as a percentage of catch. Day trips have a slightly higher percentage of cod in both landings and total catch, whether or not monkfish is included in the catch.

The 2000 data suggest that banning night fishing during this period may slightly bias the catch towards cod. This is not supported by the 1999 data, however. From these limited data, it cannot be determined whether the ban on night fishing will significantly increase the targeting of cod.

		Sink Gillnet		Bottom Longline		Otter Trawl	
Year	Data	Day	Multi-Day	Day	Multi-Day	Day	Multi-Day
1999	Cod/ Groundfish	22%	27%	64%	68%	21%	22%
	Cod/(Groundfish and Monkfish)	18%	22%	64%	68%	20%	21%
2000	Cod/ Groundfish	33%	48%	68%	98%	33%	27%
	Cod/(Groundfish and Monkfish)	29%	43%	68%	98%	32%	26%

Table 64 - Cod landed, as a percentage of groundfish landed and groundfish plus monkfish landed, area west of 69-55W.
Source: NMFS VTR

		Sink Gillnet		Bottom Longline		Otter Trawl	
Year	Data	Day	Multi-Day	Day	Multi-Day	Day	Multi-Day
1999	Cod/ Groundfish	33%	34%	65%	68%	32%	30%
	Cod/(Groundfish and Monkfish)	28%	29%	65%	68%	31%	28%
2000	Cod/ Groundfish	34%	50%	68%	98%	39%	35%
	Cod/(Groundfish and Monkfish)	30%	45%	68%	98%	38%	33%

Table 65 - Cod landed, as a percentage of groundfish caught and groundfish plus monkfish caught, area west of 69-55W.
Source: NMFS VTR

Day/Night Cod Catch Rates
There appear to be diurnal differences in catch rates for groundfish species. Many studies focused on differences noted during research survey tows, questioning whether such differences affect stock assessment information. Petrakis et al. (2001) summarized day/night differences and depth effects on catch rates for North Sea trawl surveys, focusing on whiting, herring, haddock, and dabs. They noted that differences in day/night catch rates in survey trawls were not the same for all species. The differences were attributed to changes in fish behavior. Shepherd and Forrester (1987) examined diurnal catch differences for NEFSC survey data. For cod, they report a significant effect of time of day on catches for each stock area. They stated that "catches for cod, haddock, pollock and the squid species were generally lower during dusk and night (1601-0400 hrs) and higher during dawn and day (0401-1600 hrs)" and "in all species which had significant differences in catch weight, except flounder, the lowest catches occurred during the darkest periods (dusk and night). The vertical distribution of cod, haddock, and pollock extends into the water column at night, possibly for feeding" (Beamish 1966). The implication is that some cod have a tendency to move off-bottom at night, probably to feed. Since commercial gear differs from survey gear in net size, mesh, footrope configuration, doors, and assembly, one cannot infer that the same must be true for individual commercial fishermen.

There is limited information available on the commercial catch rates of cod during day and night hours. In 1992, the NEFSC examined catch and discard rates for a variety of groundfish species using sea sampling data from 1989 through 1991 (McBride et al. 1992). Samples from otter trawl vessels were examined to determine the following:

- Relative catch rates (catch per tow and catch per hour trawling) within 12 miles, versus outside twelve mile of the coast for the 13 regulated multispecies.
- Diurnal difference in catch rates within and outside the 12 mile zone.
- Relative catch rates of sub-legal sized groundfish inside versus outside the twelve mile zone.

For the purposes of the analysis, daytime was defined as the hours from 0600 hours to 1800 hours. Tows that straddled the day/night criteria were not included. The study also examined whether there were differences in catch rates between tows within 12 miles of the coast, and tows farther offshore. Tows were examined for two areas roughly corresponding to stock areas: the Gulf of Maine defined as "north," and the area south of 42 N defined as "south." The study did not examine whether there were differential catch rates during different times of the year, and did not focus on the January through June period included in the proposed ban on night fishing.

Data were available for 1,217 day tows and 850 night tows catching cod. The general conclusion of the study was that for cod there was an increase in CPUE at night, defined as the ratio of discard/kept portions of the catch. Total catch, in terms of kilograms/tow, was also significantly higher at night. Results for cod are shown in the table below. The study only includes a statistical analysis of the catch rates for combined areas (italicized data); it is uncertain if the differences in the other catch rates are statistically significant.

	Total Catch, kg/tow							
	1989		**1990**		**1991**		**Average**	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
Inside North	7.6	10.2					7.4	10.3
Outside North	24.9	37.6	46.7	74.4	55.1	77.6	43.5	62.1
Inside South	15.2				12.8		14	
Outside South	44.2	55.3	47.3	44.9	38.7	55.4	43	52.7
Average	34.4	47.9	47	47.3	43.1	61.6	*41.1*	*53.9*

Table 66 - Catch rates (kg./tow) from observed otter trawl trips. "Inside" refers to tows within 12 nautical miles of the coast. "North" is Gulf of Maine, "South" is south of 42N latitude. (Source: McBride et al. 1992)

Following the methods of McBride et al. (1992), more recent sea sampling data (1995 through 2000) were examined in order to focus on the area and time proposed for the measure. Otter trawl tows during January through June were identified where the end of the tow was west of 69-55 W. Unfortunately, the limited number of observations prevented drawing any conclusions. Only 127 tows (92 day and 35 night) were identified. Because of the limited number of observations in some years, the data were pooled for all years. There was a significant difference in size between vessels that were observed towing during the day and those observed towing at night (average length of 55 feet for vessels towing during the day, 72 feet for vessels towing at night). In addition, the vessels observed towing during the day in 2000 were significantly smaller than those observed towing from 1995 through 1999. Most day observations took place in 2000, so this size difference may skew the day data to lower catch rates.

Conclusions

Based on the analysis, the following conclusions can be drawn concerning the biological impacts of a ban on night fishing in the area west of 69-55 W. As noted earlier, this is not the entire inshore area that will be affected by this alternative, but does focus on the areas of highest catch rates for cod.

- Given the limited data available, it is not possible to provide a quantitative estimate of the impacts of this measure.
- The benefits of the proposal will primarily be the result of the way it affects the behavior of otter trawl vessels that currently take multi-day trips. These vessels accounted for roughly one-fifth to one-fourth of the cod landed from this area in 1999 and 2000. If all of the effort from these vessels moves out of the area, then this proposal may reduce landings of cod by a similar amount. This is unlikely, however. The vessels may choose to make day trips, and unused DAS may enter the fishery, reducing the mortality reduction resulting from this measure.
- There is some evidence of higher catch rates in commercial trawls at night based on a 1992 review of three years of sea sampling data. To the extent this difference is real, preventing trawling at night may reduce catch rates. This will only result in reduced catches of cod if vessels do not increase their targeting of cod and if overall effort does not increase.

Gillnets
An increase of gillnet mesh to 6.5 inches will result in a change in selectivity, as discussed in section 5.2.6.3.3. The reduction in number of gillnets to 50 nets was described in the EA to accompany the measures implemented August 1, 2002. The changes were estimated to result in a reduction of 10 percent for GOM cod, plaice gillnet landings, 12 percent reductions in pollock landings, and 14 percent reductions in GOM haddock gillnet landings.

Hook Gear
The number of hooks allowed for longline vessels is reduced from 4,500 to 2,000 hooks. While this will reduce mortality in this sector, longline landings in this area are so low that this will have a negligible impact on mortality.

5.2.4.18 Sector Allocation Updated

The sector allocation alternative is not a stand-alone alternative and cannot be analyzed as such. A key element of any sector approach, however, is the allocation of a specific amount of a resource to a particular sector. As long as that allocation is consistent with target fishing mortality rates, this alternative is consistent with the biological objectives of the amendment. The proposed action will allow for the creation of voluntary self selecting sectors in the fishery.

5.2.4.19 GB Hook and Gillnet Sector

The proposed action only adopts the GB hook sector.

Over time, the GB hook and gillnet sector alternative should have only minor biological impacts. This alternative is based on assigning an appropriate share of the resource to the participants in this sector. The share is consistent with the rebuilding targets and the sector must remain within its share or be penalized in following years. It is possible that in a specific year the sector may catch more than its share, but this results in reductions in following years. Over time, the catch by the sector should be consistent with rebuilding goals.

5.2.5 Biological Impacts of Measures to Control Capacity

Each of the capacity alternatives is designed to achieve a long-term reduction in the number of vessels permitted to fish in Northeast fisheries. While these alternatives are intended to reduce fishing effort in the long term, some, such as permit transfers, may increase effort in the short-term. It is unknown how many permit holders will participate in capacity reduction programs, although these numbers are estimated in section 5.4.9.4, Economic Impacts of Measures to Control Capacity. If few participate in these programs, capacity reduction alternatives will do little to benefit stocks. In general, permit transfer and absorption alternatives are intended to be conservation neutral, complying with vessel upgrading restrictions and imposing a conservation tax on transferred DAS.

In one sense, capacity issues are strictly related to the economic performance of the fishery and have no impacts on the biological status *if appropriate mortality controls are adopted and implemented*. For example, if a hard TAC or quota system is in place, is adequately monitored, and adequately enforced, then it does not matter if the quota is caught by one vessel or one thousand vessels from a biological standpoint, though the economic performance of the industry would be vastly different. In reality, however, excess capacity has a bearing on achieving biological objectives because the excess capacity makes it more difficult to design appropriate management measures.

One factor that must be considered in evaluating all of these alternatives is whether a rebuilding alternative will be selected that uses a hard TAC system and whether allocated DAS will be reduced. Under a hard TAC, the number of permits or DAS becomes less of a factor in achieving the biological objectives. If allocated DAS are reduced to levels that are appropriate for the target fishing mortality rates, then the capacity alternatives will have less impacts on

5.2.5.1 No Action

This alternative was not selected.

Under this alternative, there would be no measures adopted in Amendment 13 that would specifically address capacity issues, though Rebuilding Alternative 2, if adopted, would reduce DAS allocations from the no action level of approximately 131,000 DAS. In recent years, DAS use has increased by about 10 percent per year, suggesting that mortality controls would have to be increasingly more stringent in order to meet rebuilding objectives.

5.2.5.2 Alternative 1 – Permit Absorption

This alternative was not selected.

Because some duplicate permits will expire under this alternative, the number of permits in the fisheries will be reduced minimally.

This alternative is not likely to cause a large short-term increase in fishing effort because it is so restrictive. Permits would have to be transferred as a bundle and could not transferred individually. In example, one permit for each of monkfish, squid scup and whiting would expire and the scallop and herring permits would have to be used by the same vessel, probably limiting the amount of time the vessel would have to possibly conduct a directed fishery for each of these species.

This proposal probably will increase effort in the short-term and cause some latent effort to be activated. However, the effort increase would be limited by the relatively few vessels that are likely to participate and by the fact that the permits are likely to be acquired by vessels that are already fishing. For example if a scallop vessel acquired a Fleet Category groundfish permit, it might not fish all of its available groundfish DAS in addition to scallop DAS.

5.2.5.3 Alternative 2 – Permit Transfer

This alternative was not selected.

Because this proposal does not allow DAS to be combined (“stacked”), the multispecies DAS would have to be acquired by vessels not already holding limited access multispecies permits. This would remove DAS from the multispecies fishery. This may reduce fishing effort in the groundfish fishery but increase effort in other fisheries.

This alternative differs only slightly from no action, in that most of the transfers allowed can already take place.

5.2.5.4 Alternative 3 – Days-At-Sea Transfer

The proposed action adopts the DAS transfer alternative. This alternative may result in a long-term reduction in fishing effort if it is adopted so that transferred DAS are reduced in some fashion. If DAS are not reduced through a conservation tax or other means, then it will not reduce DAS and could result in an increase in used DAS. This is more of a problem if DAS allocations are not reduced to appropriate levels and there are a large number of unused DAS that can be transferred to vessels that use them. If that happens, then mortality may increase in the short term.

5.2.5.5 Alternative 4 – Freeze on Unused DAS

This alternative was not selected. Under this alternative, permit holders electing to freeze their permits would not be able to reactivate effort for a predetermined amount of time or until stocks improved to predetermined levels. This alternative is likely to have little effect on fishing mortality. Permit holders are likely to only freeze DAS that they did not plan on using. An unused DAS –whether frozen or not – does not contribute to fishing mortality.

This alternative does not have any impacts on fishing mortality that are different than the no action alternative.

5.2.5.6 Alternative 5 – Days-At-Sea Reserve

The proposed action adopts the DAS reserve program. Because the reactivation rate of Category B and C DAS under this alternative will be based on stock conditions, this alternative should not increase fishing mortality. The various options for categorizing DAS may make it easier to reduce allocations and achieve an effort reduction under the proposed action. The actual capacity alternative itself, however, will not have any impact on fishing mortality as in all cases the number of category A DAS is higher than the DAS used in recent years and higher than the number necessary for achieving the rebuilding targets.

5.2.5.7 Alternative 6 – Mandatory latent effort categorization with voluntary flexibility options

This alternative was not adopted. Alternative 6, which combines a number of capacity reduction alternatives and defines the order in which they are implemented, should have similar biological impacts as its component alternatives. Depending on the specific capacity reduction alternatives adopted within Alternative 6, days-at-sea may or may not be reduced. It is not likely that this alternative will result in substantial reductions in fishing effort or have more than a negligible impact on the stocks.

5.2.6 Alternatives to Achieve Rebuilding Objectives

One of the major focuses of this amendment is to achieve M-S Act objectives for rebuilding overfished stocks and ending overfishing. In the following analysis, the effectiveness of the alternatives is compared to the fishing mortality necessary under a constant fishing mortality rebuilding strategy (see section 3.2 and section 3.2.3.1.2). Under a constant catch or a phased reduction strategy, the reduction needed in the first year after implementation would be less, but until the precise measures for subsequent years are defined, it is not possible to determine if the alternative will meet the objectives in following years.

5.2.6.1 Proposed Action

5.2.6.1.1 Closed Area Model

The Closed Area Model (section 5.1.1) was used to estimate the biological impacts of the following elements of this alternative:

- Year round closed areas
- Seasonal closed areas
- Trip/possession limits
- Reductions in used DAS

The proposed action includes measures to minimize, to the extent practicable, adverse effects of fishing on essential fish habitat. The model has been revised to include the area closed to mobile gear north of the NLCA (see section 3.7.3). The area closed to mobile gear in the northern Gulf of Maine has not been included in the model because of its small size.

A major element of the proposed action is a control on the number of DAS that can be used to target any groundfish species. This is done by limiting the number of Category A DAS that are allocated. While in fishing year 2002 and 2003 there were about 71,200 DAS (including carry-over DAS) that could be used to target any groundfish stock, the proposed action limits the number of Category A DAS to approximately 41,000. Evaluating the effects of this control is critical to using the closed area model to estimate the impacts of this action.

In past years, the number of DAS actually used has been a low percentage of allocated DAS. These percentages are likely to increase as allocations are reduced. A review of Table 474 reveals that while the percentage of DAS used by active permits was relatively constant from 1999 through 2001, in fishing year 2002 the percentage increased to 67 percent of the allocated DAS (including carry-over), from 59 percent in 2001. Preliminary analysis of fishing year 2003 DAS use suggests that the percentage of DAS used is increasing. A possible counter to increased use, however, would occur if the lower allocations result in some vessels not choosing to use their DAS at all because they have too few to remain in the fishery.

In addition to increases in the percentage of DAS used that may result from reduced allocations, at least two other factors may affect DAS use: the use of DAS reserve effective effort definition 9, and the implementation of a DAS leasing program. Effective effort definition number 9 allocates DAS to active groundfish vessels – those most likely to use their DAS. Implementation of a DAS leasing program means there is an incentive for a permit holder to profit from unused DAS by leasing them to a vessel that will use DAS – and reduced allocations will create an incentive for other vessels to lease the DAS. The restrictions on leasing between vessels of different sizes may help control the leasing market, but to what extent is not known. A simulation model (see section 7.3.3.7.2) suggests that even under perfect conditions, not all DAS will be used.

It is unlikely that every DAS allocated will be used. This proposed allocation of DAS grants a specific DAS allocation to every permit holder based on recent fishing history. This is very similar, in effect, to the allocations in the Individual Vessel permit category. Even after allocations were reduced in 2002, this permit category did not use ten percent of its allocated DAS, a figure that was remarkably consistent with prior years. While it's reasonable to conclude from this comparison that not every allocated Category A DAS will be used, it is not possible to predict exactly how many will not be used.

Other possible effects from DAS leasing are not reflected in this analysis. The closed area model uses several years of data, so it reflects the distribution of fishing vessels over an extended period. If DAS leasing causes changes in catch rates because the type of vessels fishing changes rapidly, this will not be captured in the model results until additional years of data are added. It should be noted that simulations of DAS leasing suggest that contrary to common expectations, DAS may actually move from larger to smaller vessels (see section 5.4.9.2.7). This could affect which stocks are targeted by the DAS being used, as smaller vessels may be less likely to fish in offshore areas.

In order to capture the uncertainty associated with the number of DAS that will be used, the closed area model was run with three different assumptions. Since the model does not include every vessel, these assumptions on the number of DAS used were converted to a reduction from the average DAS used in fishing years 2000 and 2001. By comparing these different results, it is possible to get a sense of how sensitive the results of the model are to relatively small changes in the number of DAS used. More importantly, this approach helps to characterize the likelihood that the proposed action will meet the biological objectives of the rebuilding strategies should there be changes in the number of Category A DAS used for any reason. The use rate and equivalent reduction in used DAS used in the model runs are shown in Table 67.

Because the model was run three times, there is a range of changes in exploitation and consequently a range of biological impacts (see Table 68 through Table 70). The changes in exploitation predicted by the model are shown in below. These changes in exploitation will be combined with the impacts of measures not included in the closed area model to provide an estimate of the expected change in fishing mortality. Model results are based on Category A DAS only. Available information on the likely catch of groundfish stocks in special access programs will be discussed in a following section.

Assumed Percentage of Allocated DAS Used	Assumed DAS Used	Percentage Reduction from FY 2000/2001
78 %	31,826	50 %
85 %	34,860	45 %
95 %	38,760	39 %

Table 67 – Assumptions on DAS use included in the analysis of the proposed action

	GOM	GB	SNE	Cape/GOM	SNE/Mid-Atlantic	All Loc.
Cod	-40.8	-42.7				
Haddock	-42.6	-39.6				
Winter Fldr.	-45.7	-34.7	-42.0			
Yellowtail		-34.8		-60.3	-54.5	
Windowpane	-30.1					
Plaice						-47.5
Witch Fldr.						-44.7
Pollock						-38.0
Redfish						-43.9
White Hake						-41.5

Table 68 – Changes in exploitation for the proposed action assuming a 50 percent reduction in used DAS

	GOM	GB	SNE	Cape	Mid-Atlantic	All Loc
Cod	-36.9	-38.1				
Haddock	-37.9	-35.5				
Winter Fldr.	-40.4	-31.2	-38.1			
Yellowtail		-31.1		-57.4	-49.8	
Windowpane	-26.9					
Plaice						-42.9
Witch Fldr.						-40.1
Pollock						-33.4
Redfish						-38.9
White Hake						-36.0

Table 69 – Changes in exploitation for the proposed action assuming a 45 percent reduction in used DAS

	GOM	GB	SNE	Cape	Mid-Atlantic	All Loc
Cod	-32.2	-33.4				
Haddock	-32.5	-29.6				
Winter Fldr.	-35.7	-27.1	-32.5			
Yellowtail		-26.8		-53.8	-46.2	
Windowpane	-23.2					
Plaice						-37.2
Witch Fldr.						-34.6
Pollock						-28.3
Redfish						-33.2
White Hake						-31.2

Table 70 – Changes in exploitation for the proposed action assuming a 39 percent reduction in used DAS

5.2.6.1.2 Gear Restrictions

5.2.6.1.3 Mesh Size Changes

This alternative includes measures that would change mesh regulations for trawl and gillnet vessels, increasing both trawl and gillnet mesh compared to the No Action alternative. Expected impacts were analyzed in the Environmental Assessment (EA) accompanying the Interim Action to Implement Measures to Reduce Overfishing of the Northeast Fishery Complex Under the Northeast Multispecies Fishery Management Plan (NMFS 2002), but is repeated here for clarity and supplemented with additional information. Mesh selectivity is only one of a number of factors that influences the overall selection pattern in a fishery. Fishermen can influence the size of fish they catch by fishing at different times of the year, in different locations, or by using different gear or techniques. Most mesh selectivity studies have examined smaller mesh sizes and have focused on trawls. Indeed, in one experiment that examined the performance of 6.5-inch square mesh in selecting winter flounder in southern New England (DeAlteris et al. 1999), the results suggested that scaling up earlier mesh experiments over-estimated the retention of winter flounder--that is, the mesh allowed more escapement than predicted by the earlier experiments at smaller mesh sizes. Even with adequate experiments that evaluate the selection pattern of a particular size of fish, mesh selectivity in commercial fishing operations may not match experimental results. There is evidence that selectivity can vary considerably based on different characteristics at the vessel level (Tschernej and Holst 1999). There are several mathematical models for fitting results of mesh experiments to a selectivity curve. Using a different model can result in different estimates for the selection of fish at a certain size. Studies done in different locations, or using different experimental techniques, may give different results. The exploitation pattern is only one element of fishing mortality. If effort increases, even as the exploitation pattern is shifted to older fish, it is not clear what the final impact on fishing mortality will be. For all of these reasons, it is not possible to accurately predict how an increase in mesh size will affect fishing mortality.

In addition to the difficulty in predicting the impacts of a change in mesh size, a review of past attempts to manage exploitation patterns in North Atlantic groundfish stocks indicate only partial success. Pinhorn and Halliday (2001) examined changes in partial recruitment patterns for 26 cod, haddock, and pollock stocks between the immediate period after the extension of jurisdiction (1979-1988) and the last decade of international regulation (1967-1976). While the data reviewed showed widespread, modest improvements in partial recruitment patterns, the authors were not able to correlate the improvements with the expected changes based on regulations. Problems with compliance and poor data on size of removals are two of the factors they note may obscure the impacts of mesh changes. A preliminary review of GOM cod exploitation patterns since 1981 shows that, in spite of several increases in mesh size, the partial recruitment pattern for age 4-6 fish is essentially unchanged, while fishing mortality on age 4-5 fish has declined. In contrast, a recent assessment for witch flounder found that the partial recruitment vector for the period 1999-2002 moved to older fish, leading to an increase in F40% of forty percent, from 0.164 to 0.23 (SAW 37). While many factors may have lead to this change, the SAW noted it was consistent with a change in mesh size that was implemented in 1999.

This does not mean that increases in mesh size do not have positive impacts, or that the impacts may be inconsequential. The following positive impacts should result from an increase in mesh size.

- A likely increase in spawning stock biomass per recruit.
- Discards may be reduced, as larger mesh would capture smaller numbers of fish below the minimum size limits. The impacts of this benefit also depend on the type of mesh, as square and diamond mesh have different selection patterns for flat and round fish.
- "Harvesting at a delayed PR…" [partial recruitment, i.e. harvesting at older ages] "… enables the stock to maintain a high spawning biomass with an expanded age structure, while supporting a sustainable fishery" (O'Brien 1999). To the extent that a mesh change contributes to a delayed PR, it contributes to an expanded age structure and potentially a higher spawning biomass at a given level of removals from the fishery.
- A likely increase in the number of times each fish spawns prior to capture. If the mesh size results in an increase in older spawners in the stock, there may be improvements in recruitment, since there is evidence that the eggs and larvae of older fish have higher survival rates (Trippel and Morgan 1994, Knutsen and Tielseth 1985, Kjesbu et al. 1996). Vallin and Nissling (2000) showed that, for Baltic cod, older, repeat spawners produce more, and larger, eggs than first time spawners, and showed that the number of age 2 cod recruits was positively related to the fraction of eggs produced by older females. There are some genetic data that suggest that male fertilization success increases with male body size (Hutchings et al. 1999), though other studies question this conclusion. All of these factors suggest that an increase in mesh size, to the extent it increases the age distribution and size of fish in the population, may lead to improved spawning success and recruitment.

Predicted Changes in Exploitation Pattern

As noted in the previous section, there are a number of difficulties with estimating the impacts of a change in mesh size. In order to provide a qualitative picture of the changes in exploitation that may result, selection patterns for trawl gear were calculated using the average mesh selectivity results from mesh studies as summarized in DeAlteris and Grogan (1997a). The selectivity characteristics of the mesh were plotted using a simple logistic selection curve for both diamond and square mesh. In order to show the range of possible estimates, this table also includes estimates based on specific studies used in DeAlteris and Grogan (1997a). The alternatives were chosen to illustrate the range of results from the studies using the mesh closest to the mesh under consideration, without considering location or type of experiment. Their use is not meant to imply they are the "right" values, but to illustrate the variability between results from various experiments. Age at length was converted using the Von Bertanlanffy growth parameters from various sources, as summarized in NEFMC (1994). Length was calculated at the mid-year point to consider growth over the course of the year. This section focuses on the impacts of changes in mesh size on cod.

Regardless of the specific selection factors used, the proposed mesh change has the most impact on fish in the range of 3 to 4 years. For GOM cod, this is the age when the proportion of mature fish increases from about 88 percent females/76 percent males, to about 99 percent females/94 percent males (O'Brien et al. 1993). All of the examples from the aforementioned scientific studies show that changing the minimum mesh size from the current 6-inch diamond mesh to 6.5-inch or 7-inch square mesh should reduce the probability of selection for age 3 fish. Generally, the examples show that changing the minimum mesh size from 6-inch diamond to 6.5-inch square mesh moves a given probability of selection at a certain size about 1 year into the future. An increase in trawl codend mesh from 6-inch diamond to 6.5-inch diamond, or from 6.5-inch square to 7-inch square, moves the probability of selection at a certain size less than a year into the future. That is, a fish is likely to live longer, and grow larger, before it would be retained by the larger mesh. Changing from 6-inch diamond mesh to 7-inch square mesh moves a given probability of selection at a certain size about 18 months into the future. Changing the minimum mesh size from the current 6-inch diamond mesh to 6.5-inch or 7.0-inch square mesh should reduce the probability of selection for age 3 fish.

Using the same mesh studies, the impacts on GB cod can also be illustrated. While the selectivity of the mesh does not change, the age at selection is different because of the different growth rates for GOM and GB cod. Changing mesh from 6-inch diamond to 6.5-inch square shifts the pattern about 1 year.

There are a several ongoing mesh selectivity experiments, and some additional information was provided to the Groundfish PDT by researchers working on those studies. In general, the information provided supports the relative shift in selectivity resulting from an increase in mesh size (that is, the change resulting from a mesh increase), but in some instances the absolute selectivity is different from the values obtained from DeAlteris and Grogan (1997a). Skrobe et al. (2003) calculated the Southern New England. Mid-Atlantic yellowtail flounder selectivity of 6 and 6.5 inch diamond, and 6.5 and 7 inch square mesh. Results are summarized in Table 71. These results suggest that changing the minimum mesh size in Southern New England from 6 inch diamond to 6.5 inch square mesh may result in increased retention of small yellowtail flounder (6.5 inch square mesh retains more small yellowtail flounder than 6 inch diamond mesh). Since fishermen were able to use 6.5 inch square mesh previously, it is not likely this change will have any effect on yellowtail flounder selectivity in this area.

	6.0" Diamond		6.5" Square		6.5" Diamond		7.0" Square	
L_{25} (cm)	34.8		33.0		37.4		35.5	
(*inches*)	13.7		13.0		14.7		14.0	
L_{50} (cm)	38.2	(0.36)	36.4	(0.30)	41.7	(0.52)	37.8	(0.26)
(*inches*)	15.0		14.3		16.4		14.9	
L_{75} (cm)	41.6		39.9		46.0		40.1	
(*inches*)	16.4		15.7		18.1		15.8	
SR (cm)	6.7	(0.53)	6.9	(0.55)	8.6	(0.65)	4.7	(0.34)
(*inches*)	2.6		2.7		3.4		1.8	

Table 71 - Selection curve parameter estimates and model diagnostics for yellowtail flounder selection by various experimental mesh codend configurations.
Standard errors for selected parameters are given in parentheses.
From Skrobe et al. (2003)

Effect on GOM Yield per Recruit (YPR)
YPR calculations can be used both to show the change that results from the change in exploitation, and to estimate the impact of the change on the reduction in fishing mortality for GOM cod. An increase in mesh size will not affect the full force of fishing mortality, as the increase tends to affect only a narrow range of size classes and therefore would not significantly impact fully recruited F. For GOM cod, the first age at full recruitment has been, and remains age 4, despite recent increases in codend mesh size, and the 2000 fully recruited F is 0.73. Although the stock is presently dominated by predominantly young fish, the age structure in a rebuilt stock under a low-F regime will be considerably broader. Therefore, it is important to consider the effect of the full force of fishing mortality on all fully recruited ages. An increase in mesh size will not have any impact on the fully recruited F. If a mesh increase were to shift the first age at full recruitment from age 4 to age 5, the definition of fully recruited F would simply shift from ages 4 and older fish to ages 5 and older fish, so the actual fully recruited F would remain unchanged.

Given this, it is more illustrative to examine the effect of a mesh increase (and therefore change in partial recruitment over the incompletely recruited ages) on the F reference points that can be derived from a simple YPR analysis. In this way, the impact of the mesh change can be examined from the perspective of reducing the distance between the current F and the management target F, advantageous because both Fs are in the same fully recruited units.

SAW-33 examined changes in F_{MAX} and $F_{0.1}$ reference points for GOM cod, given varying assumptions in changes in partial recruitment patterns associated with mesh change (see Table 84). The partial recruitment pattern in this analysis was calculated from the average 1999-2000 virtual population analysis (VPA) Fs at age. These years were chosen so that the calculated PR could reflect the most recent increase in mesh size.

The effects of the proposed mesh change were based on an examination of the possible impacts on selectivity at age of a ½-inch mesh size increase. It appeared that the overall effect of a ½-inch increase in mesh was a 1-year shift in the selectivity at age. However, given the incremental changes in partial recruitment that has been observed based on the VPA Fs over the past decade, it is likely that a less than full 1-year shift in partial recruitment will occur, even if the selection at age information is accurate.

Changes in mesh selectivity do not translate directly into equivalent changes in the partial recruitment pattern for several reasons:

1. Targeting behavior;
2. Illegal adjustments to the mesh;
3. Incomplete application of the regulated mesh to all gear sectors; and
4. Incomplete translation of selectivity experiments to actual field applications.

Given this, two additional YPR analyses were done. In each of these, the base partial recruitment pattern was adjusted to reflect the possible effects of the mesh change. The YPR runs were as follows:

Run 1. Base run with 2001 assessment partial recruitment pattern.
Run 2. Partial recruitment pattern from base run adjusted by ½ year.
Run 3. Partial recruitment pattern from base run adjusted by 1 year.

The 1-year shift in partial recruitment was accomplished by shifting the original PR up one full age. The ½-year shift in partial recruitment was accomplished by averaging the PR values for adjacent ages and applying the average to the higher of the two ages. All other input data to the analyses remained the same. The results are summarized below.

Estimates of F_{MAX}	Base Run	½ Year Shift	1 Year Shift
	0.27	0.30	0.34
Estimates of $F_{0.1}$	Base Run	½ Year Shift	1 Year Shift
	0.15	0.17	0.18

These reference point Fs were then compared to the calendar year 2000 F (0.73) for GOM cod. Differences between the reduction multiplier based on the current reference point with existing partial recruitment pattern and the re-estimated reference points corresponding to the adjusted partial recruitment patterns were used as the basis for percentage contributions attributed to the proposed mesh increase.

Overall, the results suggest that a ½-inch increase in mesh size may contribute, at best, 9.6 percent to the required reduction from the current F for GOM cod to F_{MAX} (63 percent) and 4.1 percent to the required reduction from the current F for GOM cod to $F_{0.1}$ (79 percent). If the mesh increase serves to shift the partial recruitment pattern by only ½ year, the contributions are about halved, to 4.1 percent and 2.7 percent for F_{MAX} and $F_{0.1}$, respectively. The estimates were based on an assumed ½-inch mesh increase for all nest fished throughout the GOM. While the proposal would increase the required mesh on diamond mesh, the square mesh provision would not change. This means that the biological impact of the mesh change estimated above would be diminished by some unknown amount.

	No change	½-year shift in PR	1-year shift in PR
$F_{0.1}$	0.15	0.16	0.18
F_{MAX}	0.27	0.30	0.34
$F_{20\%}$	0.36	0.42	0.53

Table 72 - Changes in F reference points (for GOM Cod), given varying assumptions in changes in partial recruitment patterns associated with mesh change

Impacts on Other Regulated Groundfish

There is a limited amount of selectivity information available for plaice, yellowtail flounder, pollock, and winter flounder for trawl mesh, and even less for gillnet mesh. This information is subject to the same caveats as were described in previous sections. Using the average selection factors from DeAlteris and Grogan (1997), and with the same cautions regarding the use of these data, selectivity curves comparing diamond and square mesh of different sizes for plaice (see Table 73), pollock, and GOM haddock (see Table 74) are shown below. Selection of plaice with square mesh is roughly the same as with diamond mesh that is ½ inch smaller.

	Theoretical Plaice Probability of Mesh Selection at Age			
Age/Length				
	6" diamond	6.5" diamond	6.5" square	7" square
1.5/5.2 in.	0	0	0	0
2.5/8.4 in.	0	0	0	0
3.5/11.0 in.	.08	.02	.03	.02
4.5/13.3 in.	.40	.20	.30	.10
5.5/15.1 in.	.79	.56	.78	.51
6.5/16.7 in.	.94	.85	.96	.87
7.5/18.0 in.	.98	.95	1.0	.97
8.5/35.4 in.	1.0	1.0	1.0	1.0

Table 73 - Theoretical exploitation at age for plaice. Trawl mesh selectivity from DeAlteris and Grogan (1997) using average mesh characteristics.

The selectivity results for pollock are not definitive. DeAlteris and Grogan (1997) list only one square-mesh experiment for pollock. Comparing these results to the average diamond-mesh characteristics from the same paper suggests that 6.5-inch square mesh selects a higher percentage of pollock at a given age than does 6-inch diamond mesh. This difference, however, is not consistent with other roundfish (e.g., cod, haddock) selection patterns and later experiments. Halliday et al. (1999) conducted experiments with 5.5-inch (140-mm) square and diamond mesh, and 6.1-inch (155-mm) diamond mesh. In these experiments, the length at 50-percent selection was larger for 140-mm square mesh than for either size diamond mesh. A data review of other studies by the same authors found another study, using much smaller mesh, that showed square mesh selects larger pollock than diamond mesh. Based on this paper, it is likely that square mesh will select larger pollock than diamond mesh. Halliday et al. (1999) developed the following formulas relating size at 50-percent selection (L50) to the size of mesh for pollock:

$$\text{Square: } L50 = 0.529m - 12.243$$
$$\text{Diamond: } L50 = 0.256m + 15.036$$

Based on this relationship, the pollock L50 for 7-inch square mesh is about 32 inches, and for 6.5-inch square mesh is about 29.5 inches. For 6-inch diamond mesh, the L50 is 21.2 inches. Generally, any increase in size of square mesh will provide positive biological benefits to pollock.

GOM haddock selectivity patterns are shown below. Because of the slow growth of GOM haddock, it will take longer to recover the loss in yield for this stock.

Theoretical GOM Haddock Probability of Trawl Mesh Selection At Age*				
	6-inch diamond	6.5-inch diamond	6.5-inch square	7-inch square
1.5	0	0	0	0
2.5	0	0	0	0
3.5	0.12	0.05	0	0
4.5	0.48	0.21	0.1	0.02
5.5	0.75	0.47	0.41	0.12
6.5	0.87	0.69	0.67	0.3
7.5	0.93	0.81	0.83	0.5
8.5				

Table 74 - Theoretical probability of selection at age for GOM haddock using trawl gear. Average mesh characteristics.

Source: DeAlteris and Grogan, 1997a.
** Note: GOM haddock growth slows significantly after age 7.5, little change in selection expected after that age.*

Gillnet selectivity curves are usually assumed to be roughly bell-shaped, or "Gaussian." These curves have a fish length that is the "optimal" length of selection (L_{opt}) – that is, a length that has the highest probability of selection of all lengths, usually equal to 1 – and then the probability of selection tapers off as fish size increases or decreases from this optimal length. The precise shape of these curves is subject to considerable debate, and reflects choices on the mathematical model and techniques used to describe the fish caught in the net, as well as different opinions on whether both gilled and non-gilled fish should be considered when determining selectivity. At this point, it is not clear that any one model is better than another, and the choice of model rests primarily with the data obtained and the preference of the individual researcher (Pol and Hovermale, 2000). One of the differences between the various models is how they treat fish that are at the extremes of L_{opt}. Some models assume that there is a minimum and maximum size that have a very low probability of retention in the mesh. Other models recognize that some fish at these extremes may get tangled in the mesh and still be caught, and thus these models conclude that the fish at the extremes have higher probability of retention than does the first model. These latter models explicitly recognize that "gilling" is only one way that fish are caught in gillnets.

DeAlteris and Grogan (1997) summarized available gillnet selectivity information in addition to that for trawl mesh. They used a simple, rescaled normal probability curve to estimate selection patterns. Using this model, change in probability of selection at age can be estimated using a process similar to that used for trawl gear. Unlike trawl gear, however, the theoretical exploitation pattern for gillnets shows a peak probability at some interim age, and then declining probability at both younger and older ages. The primary source used for gillnet selectivity summarized in this study is a 1992 study by DeAlteris and Lazar. One advantage of these gillnet data, compared to the available trawl data, is that the earlier study examined mesh from 6 inches to 9 inches, covering the range of mesh considered in this action. Using the average mesh characteristics from DeAlteris and Grogan (1997), the theoretical probability of selection at age for GOM cod is shown in Table 75. This table shows that the theoretical L_{opt} for gillnet mesh is roughly the same as the theoretical length at full exploitation for diamond mesh of the same size. A ½-inch increase in mesh size shifts this age/size less than 1 year into the future. For Alternative 1, then, a ½-inch increase in gillnet mesh will shift the gillnet exploitation pattern less than 1 year into the future for GOM cod.

	6-inch	6.5-inch	7-inch
Age/Length			
1.5/7.5 in.	0	0	0
2.5/13. in.	0	0	0
3.5/18 in.	0	0	0
4.5/22.3 in.	0.3	0.06	0.01
5.5/26 in.	1	0.7	0.25
6.5/29.6 in.	0.4	0.85	0.96
7.5/32.7 in.	0.03	0.21	0.65
8.5/35.4 in.	0	0	0.1
$L_{optimum}$ (cm./in.)	66.2/26 in.	71.9/28.3 in.	77.1/30.4 in.

Table 75 - Theoretical probability of gillnet selection at age for GOM cod. Based on average gillnet selection factors

Source: DeAlteris and Grogan, 1997.

**Note: Lengths at age based on Von Bertanlanffy growth parameters; annual variation likely to result in different lengths at age during any given year.*

Dynamic Effects of Mesh Change

The yield-per-recruit analysis in the previous section reflects the biological impacts of a mesh change once equilibrium is reached. The impacts shown are not realized immediately, but are achieved once the current year classes move through the fishery. In general, it should take one mean generation before the results shown are realized. This will occur at different times after implementation of the change for different species, depending on growth rates and initial stock conditions. If a mesh change is implemented, there are dynamic impacts that depend on the new selectivity pattern and current stock conditions. For example, if a mesh change shifts the exploitation pattern away from a large year class of fish, there may be an immediate loss in yield that is not accurately reflected in the YPR analysis. As those fish grow and move through the fishery, however, catching those fish at larger sizes will eventually result in the YPR predicted in the previous section.

To illustrate this concept, two projections were run for GOM cod. The first assumed the existing exploitation pattern in the fishery, and the second assumed a shift in exploitation of about one year. Both projections were run at the same fishing mortality rate and with the same initial conditions in order to isolate the effect of a change in exploitation. The projection results show that catch with the new exploitation pattern is slightly lower than under the existing pattern in the early years of the projection, with the difference narrowing over time. More importantly, they also show that the probability of achieving the target SSB in 2009 increases from just over 50 percent to 69 percent, and there is nearly a 50 percent probability of achieving the target in 2008 (Table 76). This is likely due to the presence of a strong year class and its movement through the fishery. The dynamic effects of a change in mesh size for other stocks will depend on stock conditions, the exploitation pattern that results, and the realized fishing mortality rate.

The management alternatives developed in this amendment consider the impact of a mesh change as calculated by the YPR analysis, and take these expected impacts into account when designing the alternative to meet a specific objective. Table 76 is an illustration of the dynamic effects of a shift in exploitation pattern for a given fishing mortality rate and does not indicate results expected under this amendment.

Year	Ptarget(2009) (1)	Ptarget(2009) (2)	Catch (1)	Catch (2)
2002	0.000	0.000	9,236	6,932
2003	0.000	0.000	2,688	2,380
2004	0.000	0.000	4,006	3,724
2005	0.002	0.008	5,620	5,452
2006	0.025	0.068	6,995	6,860
2007	0.108	0.232	8,307	8,191
2008	0.315	0.495	9,523	9,416
2009	0.507	0.688	10,557	10,475
2010	0.660	0.814	11,438	11,418

Table 76 – Probability of achieving SSB target for GOM cod (Ptarget) and expected catch (mt) under two mesh scenarios: (1) existing exploitation pattern; (2) exploitation pattern shifted one year, while fishing at the rebuilding mortality rate

Species without Selectivity Information

For some groundfish species that do not have selectivity information available, it is possible to use the YPR model to determine whether an arbitrary change in the exploitation pattern will result in a shift in the biological reference point. It is also possible to use the result of the YPR model to determine if, once equilibrium conditions are reached, the yield from the stock will increase or decrease. If the yield increases, long-term economic impacts from the mesh change should be positive (though there will likely be a loss of yield in the short term because of dynamic effects). This can only be done for stocks with a current age-based assessment and YPR model. If YPR declines, then the increase in mesh is resulting in a sacrifice in yield.

Concerns about potential loss of yield per recruit with increased mesh size have been raised. In order to address these concerns, the sensitivity of yield per recruit to a one year increase in selectivity at age was conducted for American Plaice, witch flounder, Georges Bank haddock, Southern New England/ Mid-Atlantic winter flounder, Georges Bank yellowtail, Cape Cod yellowtail, Southern New England yellowtail, and redfish. Yield per recruit analysis is used to evaluate the impact of age selectivity and fishing mortality rates on the expected yield per recruit over the lifetime of a cohort. The method incorporates fishing mortality rates, selectivity at age, natural mortality rate at age, somatic growth rates, and percent mature at age to determine yield per recruit.

Method

Yield per recruit input data for American Plaice, witch flounder, Georges Bank haddock, Southern New England/ Mid-Atlantic winter flounder, Georges Bank yellowtail, Cape Cod yellowtail, Southern New England yellowtail, and redfish were taken from NEFSC (2002a). Yield per recruit analyses in that report were duplicated using the NEFSC Yield and Stock size per recruit program, PDBYPRC PC ver. 2.0 found in Fishery Assessment Compilation Toolbox ver 1.50 (NEFSC 2001). New yield per recruit analyses were completed with fishing mortality at age advanced 1 year and the proportion of F in the first age in the YPR was set to zero. (Note: The advancement of fishery selectivity at age by one year is only for the purpose of conducting sensitivity analyses and is not related to expected change in selectivity of the proposed mesh size change for these species).

NEFSC 2002a recommended $F_{40\%}$ as a proxy for all the above stocks except Southern New England/ Mid-Atlantic winter flounder (F=0.32, from parametric SSB model) and Acadian Redfish ($F_{50\% MSP}$). Fmsy reference point for Southern New England / Mid-Atlantic winter flounder was estimated using a parametric spawning stock-recruit relationship combined with SSB/R analysis model. This reference point was not recalculated for a one-year increase in age selectivity. Therefore, the sensitivity of the Fmsy and yield per recruit at Fmsy to a one year shift in selectivity was not evaluated for this stock. However, sensitivity of F_{40} and $F_{0.1}$ and the corresponding yield per recruit to a one year shift in selectivity for Southern New England Mid-Atlantic winter flounder was evaluated.

Results

Results are summarized in Table 77**.** Yield per recruit increased at recommended fishing mortality threshold for all stocks (average 6.4%, range: 0.3 to 10.2%). Yield per recruit increased at $F_{0.1}$ for all stocks except Georges Bank haddock (-2.8%) and Southern New England/ Mid-Atlantic winter flounder (-0.10%). Overall, yield per recruit increase by an average 2.3%, range: -2.8 to 7.8%) with an increase of selectivity of one year. The recommended fishing mortality rate threshold increased by an average of 32% (Range: 0 to 48) and the $F_{0.1}$ increased 14% (Range: 6.8 to 17.8%)

Conclusion

Yield per recruit increased at $F_{40\% MSP}$ fishing mortality for all stocks and for 6 of 8 stocks at F0.1 for a hypothetical one year increase in age selectivity. Concerns about decreases in yield per recruit due to losses from natural mortality through increases in fishery selectivity are not supported by these sensitivity analyses. This analysis reflects results once equilibrium is achieved; as noted earlier, some loss in yield can be expected when the mesh change is first implemented.

	Standard age selectivity				Age selectivity advance 1 year				Percent difference in fully recruited F		
	F ref	F40	F0.1		F ref	F40	F0.1				
Species											
American plaice	0.166	0.166	0.174		0.211	0.211	0.205		27.1	27.1	17.8
Witch flounder	0.164	0.164	0.168		0.209	0.209	0.194		27.4	27.4	15.5
GB haddock	0.263	0.263	0.263		0.390	0.390	0.292		48.3	48.3	11.0
SNE MA winter fld[1]	0.320	0.206	0.253		0.277	0.283	0.289		Not calculated	37.4	14.2
GB yellowtail	0.248	0.248	0.265		0.362	0.362	0.307		46.0	46.0	15.8
CC/GOM yellowtail	0.214	0.214	0.231		0.298	0.298	0.271		39.3	39.3	17.3
SNE/MA yellowtail	0.269	0.269	0.242		0.373	0.373	0.272		38.7	38.7	12.4
Redfish[1]	0.040	0.040	0.059		0.040	0.040	0.063		0.0	0.0	6.8
	Yield per recruit				**Yield per recruit**				**Percent difference in yield per recruit**		
American plaice	0.17143	0.17143	0.17400		0.18884	0.18884	0.18750		10.2	10.2	7.8
Witch flounder	0.24057	0.24057	0.24200		0.25937	0.25937	0.25420		7.8	7.8	5.0
GB haddock	0.76861	0.76861	0.76830		0.80362	0.80362	0.74680		4.6	4.6	-2.8
SNE MA winter fld[1]	Not calculated	0.24621	0.26280		Not calculated	0.26109	0.26261		Not calculated	6.0	-0.1
GB yellowtail	0.23976	0.23976	0.24490		0.25695	0.25695	0.24600		7.2	7.2	0.4
CC/GOM yellowtail	0.21655	0.21655	0.22120		0.23614	0.23614	0.23030		9.0	9.0	4.1
SNE/MA yellowtail	0.22148	0.22148	0.21550		0.23420	0.23420	0.21770		5.7	5.7	1.0
Redfish[1]	0.14295	0.14295	0.16320		0.14337	0.14337	0.16790		0.3	0.3	2.9

Table 77 – Predicted changes in YPR assuming a one year shift in selectivity at age for eight groundfish stocks

[1] The Working group on Re-evaluation of biological reference points for New England Groundfish recommended $F_{40\%}$ as a proxy for all the above stocks except Southern New England/ Mid-Atlantic winter flounder (F=0.32, from parametric SSB model) and Acadian Redfish ($F_{50\% \, MSP}$). Fmsy reference point for Southern New England / Mid-Atlantic winter flounder was not recalculated for a 1 year increase in age selectivity.

5.2.6.1.4 Impacts of Changes in Gear Limits

This alternative would implement several gear changes that differ by area. With one exception (under this action trip gillnets in GB can use 150 nets), these changes are similar to those interim measures adopted August 1, 2002. These changes were analyzed in the EA accompanying those interim measures. The analysis is repeated here for clarity. The level of complexity involved with potential changes in gear and the myriad adaptive strategies that may result made it impossible to incorporate the biological impact of gear changes into the math programming model. To assess the potential impact of these changes, VTR data for trips landing regulated groundfish during fishing year 2000 were queried to ascertain area fished, catch, gear type, gear quantity, and mesh size. Each of these trips (approximately 22,500) was classified as being either a trawl, trip gillnet, day gillnet, or bottom longline trip. Each record was then examined to determine if the trip in question was already using conforming gear in terms of amount and size of gear; was using the conforming amount of gear but non-conforming size; was using conforming size but not conforming amount; or was not in conformance with either size or quantity of gear. Since hook size is not recorded on the VTR records, no analysis was possible on the minimum hook size. However, note that there is little available information on the selectivity of different size hooks. In fact, what information is available suggests that selection for larger fish is correlated with the size of the bait, rather than hook size.

Logbook records do not provide sufficient information about the size of catch. Therefore, no attempt was made to estimate the forgone yield associated with the proposed mesh size changes. However, the proportion of trips using conforming gear was estimated to provide a relative measure of what proportion of groundfish activity might be affected by the mesh size changes.

For gillnet and hook vessels, the change in numbers of nets or hook size may be more significant and provide greater biological impact than the change in mesh. In the absence of an explicit behavioral model to predict how vessels may adapt to these changes in amount of gear an estimate of the impact was developed by assuming that average landings rates (discards were not included) by species/stock per unit of gear fished (by net panel, or per hook) would be constant for all gear fished on the trip. In this manner, the biological impacts on trips where the observed quantity of gear fished would be greater than under the proposal may be estimated by multiplying the average landings by the gear limit. The resulting product provides a rough estimate of the biological impact of the changes in gear limits, exclusive of mesh.

Of the VTR-reported trips in the Northeast region, the largest proportion were taken by otter trawl vessels in the GOM (38.4 percent) (Table 78). Among other species, trawl trips landed 56.9 percent of GOM cod, 81.8 percent of GOM winter flounder, and 82.6 percent of GOM haddock. Compared to Trip gillnet vessels (4.7 percent of all trips), Day gillnet vessels accounted for proportionally more effort in terms of trips (16.1 percent), but Trip vessels landed almost as much GOM cod (18.4 percent as compared to 22.3 percent) as Day boats.

According to reported activity, 37 percent of all trips taken in the Northeast region would not be affected by either mesh or gear quantity, because both mesh size and quantity of gear used would be consistent with this alternative (Table 79). An additional 55.2 percent of trips would only be affected by the mesh change. These values include otter trawl vessels that would not be affected by any changes in quantity of gear fished. For the subset of vessels (hook and gillnet) that may be affected by changes in both mesh and quantity of gear, 55 percent of the 7,800 trips taken by these vessels were already in conformance with the proposed gear changes. An additional 22 percent of fixed gear trips would have to change mesh size, but would not be affected by the nominal reductions in gear. This leaves 23 percent of all fixed gear trips that would be affected by reductions in gear. In terms of landings, the fixed gear sector accounted for 18.3 percent of total groundfish landings, of which 12.9 percent of total landings would not be affected by a change in quantity of gear used, leaving a maximum biological benefit of approximately 5.4 percent for all regulated groundfish combined. This maximum benefit would only occur if all trips that used more than the proposed gear changes would allow were to be abandoned. Should vessels choose to fish with the reduced gear allowance, the biological impacts would be lower.

Based on the assumption that vessels do not abandon any trips, applying the average landing per unit of gear set results in an estimated aggregate reduction in regulated groundfish landings of 1.7 percent (Table 80). Across the species in the groundfish complex, estimated reductions exceeded 1 percent only for GOM cod (2.61 percent), GB cod (5.06 percent), pollock (3.99 percent), and redfish (1.99). Although the relative reduction for some species in some trip categories appears relatively large, the total reduction is low because the given category only accounts for small quantities of total landings. For example, the reduction in GB cod from Trip gillnet vessels was estimated to be almost 36 percent. However, cod landings from these trips only accounted for 1.1 percent of total GB cod landings in FY 2000. This means that the effective reduction in total GB cod landings is only 1.1 percent of 36 percent, or 0.4 percent. As noted at the beginning of this section, the proposed action differs from this analysis in that trip gillnet vessels are allowed to use 150 nets rather than 50 nets (the number of nets was limited only be vessel size prior to the interim action). If it is assumed that this does not represent any change in the way trip gillnet vessels fished in FY 2001, then the effective reduction for GB cod from this sector would be 0 percent rather than 1.1 percent, reducing the overall impacts of the gear changes to about 4 percent. It is more likely that at least some trips will be affected and the overall impacts would be between 4 and 5 percent.

	GOM				GB				SNE			
	Trawl	Trip Gillnet	Day Gillnet	Long line	Trawl	Trip Gillnet	Day Gillnet	Long line	Trawl	Trip Gillnet	Day Gillnet	Longline
Trips	38.4	4.7	16.1	0.9	9.5	0.4	6.4	4.2	17.5	0.4	1.0	0.4
Gom Cod	56.9	18.4	22.3	2.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GB Cod	0.0	0.0	0.0	0.0	62.8	1.1	21.8	10.4	2.1	0.5	0.8	0.5
GOM Winter	81.8	3.2	13.7	0.0	0.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0
GB Winter	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SNE Winter	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	99.5	0.3	0.1	0.0
GB Yellowtail	0.0	0.0	0.0	0.0	99.6	0.0	0.0	0.0	0.4	0.0	0.0	0.0
SNE/MA yellowtail	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	99.7	0.0	0.0	0.0
CC/GOM yellowtail	57.9	2.4	9.4	0.0	29.9	0.1	0.3	0.0	0.0	0.0	0.0	0.0
MA Yellowtail	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Plaice	59.8	0.2	0.6	0.0	38.7	0.0	0.0	0.0	0.6	0.0	0.0	0.0
S. Windowpane	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
N. Windowpane	62.4	0.1	0.9	0.0	35.4	0.0	0.0	0.0	1.1	0.0	0.0	0.0
GOM Haddock	82.6	12.5	2.3	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GB Haddock	0.0	0.0	0.0	0.0	95.3	0.3	3.2	0.6	0.4	0.2	0.0	0.0
White Hake	22.2	13.6	1.6	0.1	18.8	1.5	0.4	0.0	41.5	0.2	0.0	0.0
Pollock	20.7	37.3	7.5	0.0	25.3	2.7	4.5	0.1	0.2	1.7	0.0	0.0
Redfish	30.2	14.8	0.5	0.0	48.1	2.0	0.8	0.2	1.1	2.3	0.0	0.0
Witch Flounder	47.9	0.2	1.0	0.0	48.4	0.0	0.0	0.0	2.4	0.0	0.0	0.0

Table 78 - Summary of relative distribution of effort and landings by trip type and fishing area.

Trip Category	Conforming Gear	Conforming Quantity/Non-Conforming Size	Non-Conforming Quantity/Conforming Size	Non-Conforming Quantity/Non-Conforming Size	Prohibited
GOM Trawl	7.9	30.5	0.0	0.0	0.0
GOM Trip Gillnet	2.3	2.0	0.4	0.0	0.0
GOM Day Gillnet	10.8	4.8	0.2	0.0	0.3
GOM Longline	0.6	0.0	0.3	0.0	0.0
GB Trawl	1.9	7.5	0.0	0.0	0.0
GB Trip Gillnet	0.1	0.0	0.2	0.1	0.0
GB Day Gillnet	2.5	0.8	2.7	0.4	0.0
GB Longline	1.3	0.0	2.8	0.0	0.0
SNE Trawl	8.0	9.6	0.0	0.0	0.0
SNE Trip Gillnet	0.2	0.0	0.1	0.1	0.0
SNE Day Gillnet	0.9	0.0	0.1	0.0	0.0
SNE Longline	0.4	0.0	0.0	0.0	0.0
Total	37.0	55.2	6.9	0.7	0.3

Table 79 - Relative proportion of trips by conformance with proposed gear quantity and size regulations for FY 2000

		GOM				GB				SNE			
Species/Stock	Totals	Trawl	Trip Gillnet	Day Gillnet	Longline	Trawl	Trip Gillnet	Day Gillnet	Longline	Trawl	Trip Gillnet	Day Gillnet	Longline
Gom Cod	-2.61	0.00	-3.27	-7.42	-15.11	0.00	-58.33	0.00	0.00	0.00	0.00	0.00	0.00
GB Cod	-4 - -5.06	0.00	-1.52	0.00	0.00	0.00	-35.78	-12.58	-16.38	0.00	-22.21	-10.32	-2.41
GOM Winter	-0.80	0.00	-6.38	-4.11	-50.76	0.00	-58.33	0.00	0.00	0.00	0.00	0.00	0.00
GB Winter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-10.00	0.00	0.00	0.00	0.00
SNE Winter	-0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-12.99	-0.14	0.00
GB Yellowtail	0.00	0.00	0.00	0.00	0.00	0.00	-2.63	-37.50	0.00	0.00	0.00	0.00	0.00
SNE/MA yellowtail	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-11.82	-10.31	0.00
CC/GOM yellowtail	-0.58	0.00	-6.62	-2.67	0.00	0.00	-26.05	-42.08	0.00	0.00	0.00	0.00	0.00
MA Yellowtail	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plaice	-0.07	0.00	-2.44	-8.42	0.00	0.00	-33.70	-28.86	-4.10	0.00	-25.00	0.00	0.00
S Windowpane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-25.00	0.00	0.00
N. Windowpane	0.00	0.00	0.00	-0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOM Haddock	-0.68	0.00	-1.41	-14.50	-8.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GB Haddock	-0.72	0.00	0.00	0.00	0.00	0.00	-39.03	-14.51	-12.51	0.00	-24.94	0.00	0.00
White Hake	-0.90	0.00	-0.74	-8.97	-5.06	0.00	-34.25	-23.07	-10.63	0.00	-23.57	0.00	-12.35
Pollock	-3.99	0.00	-1.94	-11.35	-22.28	0.00	-42.54	-18.37	-14.54	0.00	-24.76	-0.14	-18.18
Redfish	-1.99	0.00	-1.50	-7.90	-18.30	0.00	-45.37	-29.15	-3.53	0.00	-25.08	0.00	0.00
Witch Flounder	-0.05	0.00	-0.77	-2.65	0.00	0.00	-42.63	-47.29	0.00	0.00	-6.59	0.00	0.00
Total	-1.74	0.00	-2.21	-7.26	-13.63	0.00	-38.76	-13.43	-16.24	0.00	-23.56	-9.95	-2.44

Table 80 - Biological impact of gear quantity changes by trip type and species/stock

5.2.6.1.5 Other Measures

In addition to the changes noted above, this alternative will continue several measures implemented August 1, 2002 and analyzed in the accompanying EA. These include a prohibition on front-loading of the DAS clock, an increased minimum size for cod, prohibition on the use of de-hookers in the longline fishery, and changes to the large mesh permit category. The EA estimated that these changes would have little overall biological impact, with the exception of the increased minimum size. The increased minimum size may have resulted in an initial mortality benefit, but as cod grow and become susceptible to the gear, the benefits become similar to those that result from the mesh change (see above). The increase in minimum size may result in an increase in yield per recruit and an increase in the estimate of the F_{MSY} proxy, F40%.

5.2.6.1.6 Expected mortality reductions

For the measures that can be quantified, the expected reductions in fishing mortality upon implementation of the amendment are shown in Table 81. Refer to the discussion in section 5.1 for guidance in interpreting these tables. The three columns illustrate the range of reductions in fishing mortality that can be expected if different levels of Category A DAS can be used. The last column reflects the reduction needed to comply with the appropriate rebuilding strategy. These reductions have been adjusted to account for changes in selectivity for some stocks that are expected to result from the increases in mesh size. In some cases, the reduction in mortality expected from the proposed measures is greater than that required. The Council selected these measures fully understanding that these differences would occur.

The fishing mortality rates that are expected are shown in Table 82. *These expected rates do not reflect the impact of the proposed mesh changes*. As discussed earlier, mesh changes should result in a change in the partial recruitment pattern for most stocks. This will change the yield-per-recruit and will alter biological reference points. The dynamic effects of the mesh changes may also have more impact in the early years of the rebuilding program. To reiterate, the changes in mesh are evaluated based on how they will affect reference points. This is reflected in the "necessary reductions" column of Table 81, rather than in the expected fishing mortality rates shown in Table 82. The results in this table show that for almost all stocks and under all scenarios considered for the impact of the proposed action on the number of DAS used, the mortality objectives will be met for the appropriate rebuilding strategies.

There are two stocks that the model results indicate will need careful monitoring. The closed area model predicts that fishing mortality for GOM cod, if 95 percent of allocated DAS are used, may be twenty-six percent higher than the current estimate of $F_{MSY.}$ This current estimate of F_{MSY} does not take into account the mesh increases proposed in this amendment. If the change in mesh selectivity is as effective as expected, then the mortality predicted by this scenario will meet the objectives of the amendment. In the case of witch flounder, the results suggest that overfishing may not be ended immediately for this stock, though the dynamic effects of the mesh increases on this slow growing species may be more than predicted. In the short term, the witch flounder stock is growing rapidly and is projected to increase above SSB_{MSY} with a fishing mortality rate well above F_{MSY}. The proposed action includes a default DAS reduction that will be implemented in 2006 that should insure that overfishing is ended on this stock

Stock	2001 Fishing Mortality	Expected Reduction in Mortality Assuming a Reduction in DAS Used Of			Needed Reduction (includes expected mesh effects)
		50%	**45%**	**39%**	
GB Cod	0.38	49%	45%	42%	39%
GOM Cod	0.47	47%	44%	38%	46%
GB Haddock	0.22	41%	35%	30%	NA
GOM Haddock(1)	0.12	43%	38%	33%	NA
GB Yellowtail Flounder	0.13	36%	33%	28%	NA
Cape Cod/GOM Yellowtail Flounder	0.75	69%	65%	63%	65%
SNE/MA yellowtail flounder	0.91	65%	59%	56%	59%
American Plaice	0.43	51%	49%	42%	41%
Witch Flounder	0.76	53%	49%	42%	67%
GOM Winter Flounder	0.14	50%	43%	34%	NA
GB Winter Flounder	0.25	38%	32%	28%	NA
SNE/MA Winter Flounder	0.51	49%	43%	37%	31%
Acadian Redfish(3)	0.01	--	--	--	--
White Hake(1)	1.36	42%	37%	32%	17%
Pollock(1)	3.55	40%	36%	31%	NA
Windowpane Flounder (North)(1)	0.1	30%	27%	23%	NA
Windowpane Flounder (South)(1)(4)	0.69	NA	NA	NA	NA
Ocean Pout(4)	0.008	NA	NA	NA	NA
Atlantic Halibut(4)	NA	NA	NA	NA	NA

Table 81 – Estimated mortality reductions expected under the proposed action, assuming different levels of a reduction in DAS used

(1) Index based stock assessments
(2) Reduction needed to end overfishin g
(3) Changes lost in rounding errors
(4) Closed area model results not reported due to low levels of input data

Stock	2001 Fishing Mortality	Expected Fishing Mortality Assuming a Reduction in DAS Used Of		
		50%	45%	39%
GB Cod	0.38	0.19	0.21	0.22
GOM Cod	0.47	0.25	0.26	0.29
GB Haddock	0.22	0.13	0.14	0.15
GOM Haddock(1)	0.12	0.07	0.07	0.08
GB Yellowtail Flounder	0.13	0.083	0.087	0.09
Cape Cod/GOM Yellowtail Flounder	0.75	0.23	0.26	0.28
SNE/MA yellowtail flounder	0.91	0.32	0.37	0.40
American Plaice	0.43	0.21	0.22	0.25
Witch Flounder	0.76	0.36	0.39	0.44
GOM Winter Flounder	0.14	0.07	0.08	0.09
GB Winter Flounder	0.25	0.15	0.17	0.18
SNE/MA Winter Flounder	0.51	0.26	0.29	0.32
Acadian Redfish(3)	0.01	< 0.01	< 0.01	< 0.01
White Hake(1)	1.36	0.79	0.86	0.93
Pollock(1)	3.55	2.11	2.27	2.44
Windowpane Flounder (North)(1)	0.1	0.07	0.07	0.08
Windowpane Flounder (South)(1)(4)	0.69	< 0.69	< 0.69	< 0.69
Ocean Pout(4)	0.008	NA<0.01	NA	NA
Atlantic Halibut(4)	NA	NA	NA	NA

Table 82 – Expected fishing mortality under three different assumptions on the reduction in used DAS. Rates shown do not include any impacts due to mesh increases.

(1) Index based stock assessments
(2) Reduction needed to end overfishing
(3) Changes lost in rounding errors
(4) Closed area model results not reported due to low levels of input data

5.2.6.1.7 Category B DAS

The proposed action defines some DAS as Category B (regular) or Category B(reserve) DAS. Catches of groundfish on a Category B DAS are not estimated in the closed area model and must be evaluated outside the model. In concept the B (regular) DAS can be used to target healthy stocks outside of a special access program. The restrictions and opportunities for using Category B (regular) DAS outside of a special access program have not yet been defined. Either type of Category B DAS can be used in an approved special access program.

There are three SAPs proposed that are available for Category B DAS (a fourth program does not require the use of Category B DAS). Estimates of the likely catch of groundfish while participating in the Closed

Area II GB Yellowtail Flounder SAP are described in section. Estimates of the catch of winter flounder in the SNE/MA winter flounder SAP are described in section 5.2.4.6.2. Because of a lack of experimental data, estimates are not available for the other two SAPs.

Vessels participating in the CA II yellowtail flounder SAP are allowed to fish in statistical areas 561 and 561 (Canadian areas 5zjm) using B DAS while participating in the SAP. Based on observer and experimental data, they can be expected to catch GB haddock, GB winter flounder, and GB cod while fishing in this area. The analysis in section 5.2.4.6.1 suggests that vessels participating in this SAP may catch 301 mt of cod, 709 mt of haddock, and 2,355 mt of winter flounder while using roughly 800 B DAS on 320 trips. These estimates are subject to uncertainty over the exact impacts of the haddock separator trawl, which is known to reduce cod and flounder catches while fishing for haddock. Given that the proposed action is expected to reduce mortality for both GB haddock and winter flounder more than is necessary under all three assumed used DAS scenarios, the catches resulting from this program should prevent achieving the biological objectives for those two stocks. If the US/CA Resource Sharing Understanding is implemented, both GB cod and GB haddock in the area will be subject to a hard TAC. Assuming adequate observer coverage to estimate discards, the catch of GB cod should remain within targeted limits. There is a strong incentive for vessels fishing in the area to avoid GB cod since if they do not, most of the area will be closed to fishing for groundfish and they will be unable to target healthy haddock and yellowtail stocks in the area.

The proposed SAP that allows retention of small amounts of SNE/MA winter flounder while fishing for fluke is discussed in section 5.2.4.6.2. This SAP does not require the use of any DAS. It is intended to convert discards of winter flounder into landings, thereby reducing bycatch consistent with the requirements of the M-S Act. While limited sea sampling data suggests that fluke and winter flounder are rarely caught on the same trips, VTR data suggests the opposite. Based on this analysis, it appears that this program may convert about 200 mt of discards into landings. This does not represent an increase in mortality. It is possible, however, that fishing effort could increase. Some fluke vessels have used a groundfish DAS in the past to land small amounts of winter flounder while on a fluke trip. This SAP will exempt them from having to do so. Those DAS are thus available for the fluke vessels to use on targeted groundfish trips taken at some other time, using groundfish mesh. The proposed action, however, is expected to reduce fishing mortality on SNE/MA winter flounder more than is necessary. The target TAC will be approximately 2,800 mt in the first year of the program. Landings in calendar year 2002 reached this amount, but landings in calendar year 2003 through August were about half the previous year, even though overall DAS use had increased. The proposed measures are more restrictive than the current measures. These observations suggest that it is not likely the target TAC for SNE/MA winter flounder will be exceeded if this SAP is authorized.

The US/CA Resource Sharing Understanding SAP allows vessels to fish for ten months of the year in the northern part of CA II to target haddock. Vessels on these trips can also fish in statistical areas 561 and 562 (5zjm). There is little data available to estimate catches on these trips. Observer data show that cod and haddock are frequently caught on tows in statistical area 561 and 562. While the haddock separator trawl should help reduce cod catches, the main control on this program will be the hard TAC adopted for the area. This will prevent the program from threatening the rebuilding programs for GB cod and GB haddock.

5.2.6.2 No Action Alternative (not selected)

Under the no action alternative, fishing mortality is expected to remain at 2001 levels, described in section 9.2.1.1. M-S Act requirements to achieve rebuilding and end overfishing will not be met. Age-based projection results are shown in the no action fishing mortality levels in Table 83. This table illustrates the expected stock size and catch if the no action mortality (2001 fishing mortality) is maintained. Projected stock size and landings are shown for 2026, after the end of the proposed GB cod rebuilding period but well before the end of the redfish rebuilding program. For these ten stocks with age-based projection results, SSB should more than double, while catch of these stocks will increase by 64 percent. Stocks and landings of plaice, witch flounder, and CC/GOM yellowtail flounder are projected to decline, and stock size and landings for the other seven stocks will increase. For those stocks that are projected to increase, the projected stock size in 2026 approaches or exceeds the highest levels estimated in the VPA time series. (Projected stock size over long time periods are subject to error as a result of the difference between projected and observed recruitment).

Stock	Median SSB ('000 mt)		Median landings ('000 mt)	
	2002	2026	2002	2026
Georges Bank cod	21.8	90.2	10.8	29.6
Gulf of Maine cod	23.8	45.5	7.2	15.7
Georges Bank haddock	99.6	270.9	12.9	46.7
Georges Bank yellowtail flounder	47.3	81.1	5.6	9.6
Southern New England/Mid-Atlantic yellowtail flounder	1.6	20.9	0.7	11.6
Cape Cod/Gulf of Maine yellowtail flounder	2.5	2.8	2.7	2.5
Southern New England/Mid-Atlantic winter flounder	5.9	15.2	3.5	9.6
American plaice	14.5	12.4	3.9	5.7
Witch flounder	18.7	10.3	4.0	4.7
Acadian redfish	130	243.5	0.4	0.8
Total	365.7	792.8	51.7	136.5

Table 83 - Projections of spawning stock biomass and landings for age-based assessments under no-action alternative

SSB = spawning stock biomass

5.2.6.3 Alternative 1 – Up to 65 percent reduction in DAS

This alternative incorporates up to a 65 percent reduction in used DAS with the management measures implemented August 1, 2002. These measures were previously analyzed in an EA (NMFS 2002). Additional possession limits and gear restrictions are also applied.

This alternative was not selected.

5.2.6.3.1 Closed Area Model

The Closed Area Model (section 5.1.1) was used to estimate the biological impacts of the following elements of this alternative:

- Year round closed areas
- Seasonal closed areas

- Trip/possession limit.
- Reductions in used DAS: There are two alternative DAS reductions. The first option is a 55 percent DAS reduction designed to meet the mortality objectives of the constant F or adaptive rebuilding strategies. The second option phases in a 65 percent DAS reduction over time. For the second option, only the impacts of the first year's mortality reduction are modeled. Results for these two options are shown separately.

The changes in exploitation predicted by the model are shown in Table 84 below. These changes in exploitation will be combined with the impacts of other measures to provide an estimate of the expected change in fishing mortality.

	GOM	GB	SNE	Cape/GOM	SNE/Mid-Atlantic	All Loc
Cod	-45.5%	-43.4%				
Haddock	-47.7%	-44.2%				
Winter Fldr.	-50.6%	-36.3%	-58.3%			
Yellowtail		-38.9%		-60.3%	-72.7%	
Windowpane	-31.6%					
Plaice						-52.9%
Witch Fldr.						-50.6%
Pollock						-42.3%
Redfish						-49.3%
White Hake						-47.7%

Table 84 – Changes in exploitation for Alternative 1 with a 55 percent reduction in used DAS

	GOM	GB	SNE	Cape	Mid-Atlantic	All Loc
Cod	-25.6%	-25.9%				
Haddock	-25.8%	-26.1%				
Winter Fldr.	-32.9%	-21.7%	-42.7%			
Yellowtail		-23.6%		-46.5%	-60.5%	
Windowpane	-17.9%					
Plaice						-33.5%
Witch Fldr.						-32.0%
Pollock						-24.8%
Redfish						-30.2%
White Hake						-29.1%

Table 85 – Changes in exploitation for first year Alternative 1 under the phased reduction rebuilding strategy, with a 35 percent reduction in used DAS the first year

5.2.6.3.2 Gear Restrictions

5.2.6.3.3 Mesh Size Changes

This alternative includes measures that would change mesh regulations for trawl and gillnet vessels, increasing both trawl and gillnet mesh compared to the No Action alternative. Expected impacts were analyzed in the Environmental Assessment (EA) accompanying the Interim Action to Implement Measures to Reduce Overfishing of the Northeast Fishery Complex Under the Northeast Multispecies Fishery Management Plan (NMFS 2002). Refer to the gear impacts under the proposed action for this information

5.2.6.3.4 Impacts of Changes in Gear Limits

This alternative would implement several gear changes that differ by area. With one exception (under this action trip gillnets in GB can use 50 nets), these changes are similar to those described for the proposed action. The difference in the number of trip gillnets on Georges Bank means that the gear changes in this alternative have a slightly greater impacts on GB cod. Refer to the proposed action discussion for information on the effects of gear changes.

5.2.6.3.5 Additional Gear Restrictions

This alternative includes two options for the requirement to use a raised footrope trawl in the inshore GOM in order to reduce catches of CC/GOM yellowtail flounder. The raised footrope trawl was designed to facilitate whiting fishing while avoiding the catch of flounders, especially CC/GOM yellowtail flounder. A series of experimental fisheries demonstrated its effectiveness. The raised footrope trawl has proven effective at reducing yellowtail landings, meeting the 5 percent exempted fishery standard in block 124 for a whiting fishery (see Framework 35). This requirement differs from the net used in the experimental and exempted fisheries, as vessels will be required to use the net with large mesh rather than the smaller whiting mesh. The design has not been tested with large mesh, but it is not likely that more flounders will be caught than with the whiting mesh. The impacts of this requirement depend on the area where the net is required, as well as the amount of effort expended in that area.. Rather than estimate the number of trips, or tows that will use the net, the following analysis assumes the relative proportion of effort on yellowtail flounder remains the same by area., and reflects a relative change in exploitation for this stock. In this way the change in exploitation can be combined with the results from the closed area model to estimate the total change in exploitation for this stock.

Option 1 requires the net in specific thirty-minute blocks. Trawl landings from these blocks account for approximately 40 percent of the total CC/GOM yellowtail flounder landings. If the net reduces these landings by 95 percent, the expected reduction in exploitation would be about 38 percent, assuming that there is no shift of effort into the area.

Option 2 requires the net in statistical areas 514 and 521. Trawl landings from these two areas averaged 75 percent of the total CC/GOM yellowtail flounder landings (fishing years 1995 through 2001). If the net reduces these landings by 95 percent, the expected reduction in overall landings would be about 70 percent, assuming that there is no shift of effort into the area.

While this requirement is designed to reduce yellowtail catches, it can also be expect to reduce landings of other species. The most likely species to be affected are flatfish such as plaice, which are also targeted in this area (this stock is also in need of a mortality reduction). The impact of the net on cod or other roundfish is not certain. Massachusetts DMF conducted an experiment that compared catches of a raised footrope trawl to a normal whiting trawl in 1997. A total of 68 paired tows were observed on three different vessels, with all fishing conducted in the inshore GOM. While cod catch rates were generally low, ranging from 0 to 140 lbs/hour for both nets, no significant difference in cod catches were found between the two types of net, suggesting that this net will still allow catches of cod (Mike Pol, pers. comm.). If there is any impact, however, it is likely the net may reduce cod catches.

One factor that cannot be evaluated is the impact of the net on fishermen's behavior. If the net is successful in reducing yellowtail flounder catches significantly, it may result in a redirection of effort onto other stocks.

5.2.6.3.6 Other Measures

In addition to the changes noted above, this alternative would continue several measures implemented August 1, 2002 and analyzed in the accompanying EA. These include a prohibition on front-loading of the DAS clock, an increased minimum size for cod, prohibition on the use of de-hookers in the longline fishery, and changes to the large mesh permit category. The EA estimated that these changes would have little overall biological impact, with the exception of the increased minimum size. The increased minimum size may have resulted in an initial mortality benefit, but as cod grow and become susceptible to the gear, the benefits become similar to those that result from the mesh change (see above).

5.2.6.3.7 Summary

Four tables present the expected biological impacts of this alternative. The combined impacts of Alternative 1A (for the measures that can be quantified) are estimated in Table 86 for the 55 percent DAS reduction necessary to meet the constant fishing mortality and adaptive fishing mortality rebuilding strategies. Impacts of Alternative 1C, using the same DAS reduction but with a different GB cod trip limit, are shown in Table 88. There are only minor differences in the expected results. With the exception of white hake, the reductions in mortality expected in these alternatives meet or exceed the necessary reduction for all rebuilding alternatives. Measures that will reduce white hake mortality that cannot be quantified primarily include the mesh increase. Selectivity information for white hake is not available. Selectivity of white hake will likely change given the mesh increases proposed. If this results in a change in reference points of 10 percent or more (as explained above for other stocks), the fishing mortality reductions expected from this alternative will be very close to that needed for this stock.

The combined impacts for the first year of the phased reduction strategy – Alternative 1B, using a phase-in of the DAS reduction – are shown in Table 87. Impacts of Alternative 1D, using the same DAS reduction but a lower GB cod trip limit, are shown in Table 89. (Note that reductions necessary under other rebuilding strategies are not shown in these tables because this alternative is not consistent with those strategies). With the exception of white hake and witch flounder, these alternatives meet the necessary reduction for all stocks. DAS reductions in future years should address the concern over ending overfishing on witch flounder, and additional reductions can be expected for white hake due to the mesh increase as explained in the previous paragraph.

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks			Expected Reduction
		Constant F	Phased F	Adaptive	
GB Cod	0.38	53%	+13%	53%	50%
GOM Cod	0.47	53%	32%	51%	53%
GB Haddock	0.22	+14%	0%	NA	45%
GOM Haddock(1)	0.12	+83%	NA	+92%	48%
GB Yellowtail Flounder	0.13	+77%	NA	+92%	38%
Cape Cod/GOM Yellowtail Flounder	0.75	88%	3%	77%	81%/91%
SNE/MA yellowtail flounder	0.91	80%	45%	71%	80%
American Plaice	0.43	65%	47%	60%	58%
Witch Flounder	0.45	67%(2)	67%(2)	67%(2)	56%
GOM Winter Flounder	0.14	NA	NA	NA	36%
GB Winter Flounder	0.25	NA	NA	+28%	40%
SNE/MA Winter Flounder	0.51	51%	31%	37%	65%
Acadian Redfish	0.01	0%	0%	0%	
White Hake(1)	1.36	69%	69%*	60%	48%
Pollock(1)	3.55	NA	NA	+66%	45%
Windowpane Flounder (North)(1)	0.1	NA	NA	NA	32%
Windowpane Flounder (South)(1)	0.69	2%	2%	2%	
Ocean Pout	0.008	NA	NA	NA	NA
Atlantic Halibut	NA	NA	NA	NA	NA

Table 86 – Estimated mortality reductions expected under Alternative 1A with a 55 percent DAS reduction

(1) Index based stocks
(2) Reduction needed to end overfishing

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks	Expected Reduction
		Phased F	
GB Cod	0.38	+13%	34%
GOM Cod	0.47	32%	32%
GB Haddock	0.22	0%	32%
GOM Haddock(1)	0.12	NA	26%
GB Yellowtail Flounder	0.13	NA	31%
Cape Cod/GOM Yellowtail Flounder	0.75	3%	74%/88%
SNE/MA yellowtail flounder	0.91	45%	69%
American Plaice	0.43	47%	40%
Witch Flounder	0.45	67%(2)	38%
GOM Winter Flounder	0.14	NA	36%
GB Winter Flounder(1)	0.25	NA	24%
SNE/MA Winter Flounder	0.51	31%	49%
Acadian Redfish	0.01	0%	
White Hake(1)	1.36	69%*	30%
Pollock(1)	3.55	NA	28%
Windowpane Flounder (North)(1)	0.1	NA	18%
Windowpane Flounder (South)(1)	0.69	2%	NA
Ocean Pout	0.008	NA	NA
Atlantic Halibut	NA	NA	NA

Table 87 – Estimated mortality reductions expected under first year of Alternative 1B under the phased reduction fishing mortality strategy with a 35 percent DAS reduction the first year

(1) Index based stocks
(2) Reduct ion needed to end overfishing

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks			Expected Reduction
		Constant F	Phased F	Adaptive	
GB Cod	0.38	53%	+13%	53%	53%
GOM Cod	0.47	53%	32%	51%	53%
GB Haddock	0.22	+14%	0%	NA	47%
GOM Haddock(1)	0.12	+83%	NA	+92%	48%
GB Yellowtail Flounder	0.13	+77%	NA	+92%	38%
Cape Cod/GOM Yellowtail Flounder	0.75	88%	3%	77%	81%/91%
SNE/MA yellowtail flounder	0.91	80%	45%	71%	80%
American Plaice	0.43	65%	47%	60%	58%
Witch Flounder	0.45	67%(2)	67%(2)	67%(2)	56%
GOM Winter Flounder	0.14	NA	NA	NA	36%
GB Winter Flounder	0.25	NA	NA	+28%	40%
SNE/MA Winter Flounder	0.51	51%	31%	37%	65%
Acadian Redfish	0.01	0%	0%	0%	
White Hake(1)	1.36	69%	69%*	60%	48%
Pollock(1)	3.55	NA	NA	+66%	45%
Windowpane Flounder (North)(1)	0.1	NA	NA	NA	32%
Windowpane Flounder (South)(1)	0.69	2%	2%	2%	NA
Ocean Pout	0.008	NA	NA	NA	NA
Atlantic Halibut	NA	NA	NA	NA	NA

Table 88 – Estimated mortality reductions expected under Alternative 1C with a 55 percent DAS reduction

(1) Index based stocks

(2) Reduction needed to end overfishing

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks	Expected Reduction
		Phased F	
GB Cod	0.38	+13%	38%
GOM Cod	0.47	32%	32%
GB Haddock	0.22	0%	32%
GOM Haddock(1)	0.12	NA	26%
GB Yellowtail Flounder	0.13	NA	23%
Cape Cod/GOM Yellowtail Flounder	0.75	3%	74%/88%
SNE/MA yellowtail flounder	0.91	45%	69%
American Plaice	0.43	47%	40%
Witch Flounder	0.45	67%(2)	38%
GOM Winter Flounder	0.14	NA	36%
GB Winter Flounder(1)	0.25	NA	24%
SNE/MA Winter Flounder	0.51	31%	49%
Acadian Redfish	0.01	0%	
White Hake(1)	1.36	69%*	30%
Pollock(1)	3.55	NA	28%
Windowpane Flounder (North)(1)	0.1	NA	18%
Windowpane Flounder (South)(1)	0.69	2%	NA
Ocean Pout	0.008	NA	NA
Atlantic Halibut	NA	NA	NA

Table 89 – Estimated mortality reductions expected under first year of Alternative 1D under the phased reduction fishing mortality strategy with a 35 percent DAS reduction the first year

(1) Index based stocks
(2) Reduction needed to end overfishing

5.2.6.4 Alternative 2 – Reduction in Allocated DAS/Gear Modifications

Alternative 2 builds on the measures implemented August 1, 2002 by adding additional gear requirements, reducing the GB cod trip limit, and by providing two approaches to DAS use in the GOM. In addition, in order to insure that the biological objectives are met, a hard TAC system is overlaid as a backstop. Both the closed area model and the hard TAC/trip limit models were used to quantify potential impacts. These models attempt to quantify impacts differently; both sets of results are reported and, while they differ in magnitude, the direction of the impacts is essentially the same. Many of the measures in this alternative were analyzed in the EA accompanying the measures implemented August 1, 2002 and are not re-analyzed in this section. This alternative was not selected.

5.2.6.4.1 Closed Area Model

The Closed Area Model (section 5.1.1) was used to estimate the economic impacts of the following elements of this alternative:

- Year round closed areas
- Seasonal closed areas
- Trip/possession limits
- Reductions in allocated DAS
- Hard TAC

The use of the closed area model differed from its use in the EA. For the measures implemented August 1, 2002, the EA assumed that because the total number of allocated DAS exceeded the DAS used in the previous fishing year, the reduction in allocated DAS would not have any impact on DAS use. Since May 1, 2002, DAS use has been about 60 percent of DAS use in the previous year, suggesting that the EA assumption on DAS use may have been incorrect. In this analysis, the reduction in allocated DAS is assumed to result in a similar reduction in used DAS. Thus, this analysis may be a best-case scenario.

The modeling of a hard TAC also created difficulties for the use of the model. The Hard TAC options were approximated by individually allocating each vessel quota based on their landings in the status-quo model run and percentage change in expected landings under a quota. It should be noted that in theory the expected biological outcomes should be similar for all options using an overall hard TAC. However, this may not hold when modeled at the individual vessel level due to the influence of other management measures on each vessel. In effect, what has been modeled are individual vessel quotas. This was necessary to simulate the economic impacts of these alternatives. In essence, the TAC was assigned to each vessel according to its past catch history, and a vessel stopped fishing for that species when its allocation was caught. Even though the hard TAC should assure that the biological objectives are met, the model was run both to help in the analysis of distributive impacts and to see how overall mortality might be affected. Because the model optimizes each vessel's fishing patterns, interactions between vessels were not possible to capture, meaning the "race to fish" which is prevalent in many quota systems was not part of the model. The model chose locations and times for each vessel to fish in order to maximize its revenue, while meeting their individual quota constraints. For stocks which were caught in the same space and time as those constrained by the quota for a vessel, the model would not allow that vessel to fish at those locations once TAC constraints were met. This is similar to the option that would require an area to close when a TAC is caught, though that decision would be based on the performance of all vessels, rather than one vessel. While it may be possible that future changes in gear or fishing technique might allow fishing for one stock after the TAC for a different stock is caught, at present there are few, if any, such adaptations identified. Therefore, the model would project reductions in mortality for those stocks. Whether these reductions actually occur depends on how the TAC system is administered. Mortality could increase on all stocks if fishing were allowed to continue in areas once TACs were met, but with high levels of discards.

The use of hard TACs reduces the need to estimate the biological impacts of this alternative. The predicted changes in exploitation from the closed area model and a summary of the biological impacts without the inclusion of the hard TAC are shown below. This information can be used to show how likely it is that the hard TAC backstop will be imposed. For stocks where the effort control measures fall short of the necessary mortality reduction, it is more likely that a hard TAC will be imposed during the fishing year. The greater the gap between the necessary reduction and the amount of a reduction expected from the effort controls, the earlier in the fishing year the TAC will be reached.

	GOM	GB	SNE	Cape/GOM	SNE/Mid-Atlantic	All Loc
Cod	-24.0%	-22.4%				
Haddock	-16.7%	-14.2%				
Winter Fldr.	-24.0%	-15.8%	2.8%			
Yellowtail		-6.9%		-29.7%	-14.6%	
Windowpane	-10.6%					
Plaice						-18.9%
Witch Fldr.						-16.4%
Pollock						-14.6%
Redfish						-16.0%
White Hake						-16.1%

Table 90 – Changes in exploitation for Alternative 2, first option for counting DAS in the GOM, without applying the hard TAC.

	GOM	GB	SNE	Cape	Mid-Atlantic	All Loc
Cod	-19.0%	-17.8%				
Haddock	-5.5%	-8.1%				
Winter Fldr.	-8.7%	-13.7%	1.1%			
Yellowtail		-6.2%		-28.6%	-1.2%	
Windowpane	-10.5%					
Plaice						-10.7%
Witch Fldr.						-6.2%
Pollock						-7.0%
Redfish						5.0%
White Hake						-11.0%

Table 91 – Changes in exploitation for first year of Alternative, second option for counting DAS in the GOM, without applying the hard TAC.

5.2.6.4.2 Hard TAC/Trip Limit Model Results

As noted above, the closed area model does not capture any derby impacts of the proposed alternative. Under the closed area model, each vessel is allowed to catch its "share" of the quota without regard to the performance of other vessels. Derby impacts are well documented in the literature for fisheries that do not assign quotas to individual vessels (for example, Morgan 1997). The hard TAC/trip limit model was also applied to the measures in rebuilding Alternative 2 to attempt to capture derby impacts associated with this alternative, and to quantify the impacts of trip limits that take effect once a portion of a TAC is reached. These derby impacts are well documented in the literature for fisheries that do not assign quotas to individual vessels (for example, Morgan 1997). This model is more accurately tuned to the specifications of the rebuilding alternatives in that it accounts for increased fishing pressures early in the fishing year, and estimates trip limits and consequent discards that correspond to the TAC thresholds specified in the management measures. Specifically, the model was calibrated in the same manner as the closed area model to account for the raised footrope trawl in areas 514 and 521 and the haddock separator trawl on Georges Bank. If the more specific 30 minute square option is chosen for the raised footrope trawl, then the impacts will be lessened and TACs likely will be achieved sooner.

Because the model is based on actual fishing behavior from FY 2001, it does not account for changes in fishing practices that may occur as TACs are reached and trip limits are instituted; this is a major advantage of the closed area model (see previous section).

GOM haddock, GB haddock, Pollock, redfish, GOM winter flounder, GB winter flounder, northern and southern windowpane flounder, GB yellowtail flounder and witch flounder are not predicted to reach the TAC threshold. If the option to close a stock area once TACs are achieved for a particular stock is selected, alternative 2 may meet biological objectives (though areas could be closed as soon as one week into the fishing year). However, if retention of impacted species is prohibited, analysis indicates that TACs may be legally exceeded by large amounts.

		70% Threshold							90% Threshold						
Stock	**2004 F_Rebuild TAC**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**
GOM cod	2,663	**145 lbs**	Sep	2,156	507	1,478	30,380	9,476	**55 lbs**	Sep	2,441	223	1,300	30,380	13,103
white hake	3,199	**565 lbs**	Jan	2,757	443	690	15,292	7,068	**605 lbs**	Jan	3,072	126	374	15,292	9,559
SNE winter fl	2,239	**155 lbs**	Sep	1,634	596	1,526	18,189	3,911	**55 lbs**	Sep	2,023	216	1,204	18,189	5,540
Am. plaice	2,311	**95 lbs**	Sep	1,762	547	2,092	32,624	8,971	**35 lbs**	Sep	2,104	207	2,079	32,624	11,636
Stock	**2004 F_Rebuild TAC**	**Threshold (75%)**	**Trip limit (lbs per day)**	**Month TAC Achieved**	**Predicted Landings - 500 lbs trip limit**	**Predicted Discards - 500 lbs trip limit**	**Predicted Landings - 100 lbs trip limit**	**Predicted Discards - 100 lbs trip limit**	**Total Modeled Landings**	**Total Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**		
GB cod (75% thld)	2,747	1,923	**500/100**	Jun	598	1,215	54	632	652	1,847	6,504	29,947	3,375		
	2004 F_Rebuild TAC	**Trip limit (lbs per day)**	**Month TAC Achieved**	**Total Modeled Landings**	**Total Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**							
CCGOMyt (no thld)	235	**50 lbs**	May	12	153	1,922	17,261	709							
	2004 F_Rebuild TAC	**Trip limit (lbs per day)**	**Month TAC Achieved**	**Predicted Landings May 1 - May 31**	**Predicted Discards May 1 - May 31**	**Predicted Landings June 1 - Feb 28**	**Predicted Discards June 1 - Feb 28**	**Predicted Landings Mar 1 - Apr 30**	**Predicted Discards Mar 1 - Apr 30**	**Total Modeled Landings**	**Total Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**	
SNEyt (no thld)	645	**250/750**	March	172	1,493	396	188	0	140	568	1,821	1,821	7,117	5,375	

Table 92 – Predicted TACs, trip limits, thresholds, landings, discards and DAS use for rebuilding alternative 2 under the constant mortality rebuilding strategy. Landings in metric tons.

		70% Threshold							90% Threshold						
Stock	**2004 Phased_F TAC**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**
GOM cod	3,732	**320 lbs**	Dec	3,312	420	715	30,380	14,442	**290 lbs**	Dec	3,565	163	570	30,380	18,977
white hake	3,199	**565 lbs**	Jan	2,757	443	690	15,292	7,068	**600 lbs**	Jan	3,072	126	374	15,292	9,559
SNE winter fl	3,011	**275 lbs**	Dec	2,342	669	941	18,189	5,820	**170 lbs**	Dec	2,768	243	602	18,189	8,612
Am. plaice	3,391	**230 lbs**	Dec	2,847	542	1,130	32,624	13,739	**190 lbs**	Nov	3,171	219	938	32,624	18,906
Stock	**2004 Phased_F TAC**	**Threshold (75%)**	**Trip limit (lbs per day)**	**Month TAC Achieved**	**Predicted Landings - 500 lbs trip limit**	**Predicted Discards - 500 lbs trip limit**	**Predicted Landings - 100 lbs trip limit**	**Predicted Discards - 100 lbs trip limit**	**Total Modeled Landings**	**Total Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**		
GB cod (75% thld)	5,920	4,144	**500/100**	Oct	1,499	2,804	135	1,340	1,634	4,144	6,162	29,947	8,933		
	2004 Phased_F TAC	**Trip limit (lbs per day)**	**Month TAC Achieved**	**Total Modeled Landings**	**Total Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**							
CCGOMyt (no thld)	1,664	**50 lbs**	Oct	160	1,311	1,838	17,261	9,416							
	2004 Phased_F TAC	**Trip limit (lbs per day)**	**Month TAC Achieved**	**Predicted Landings May 1 - May 31**	**Predicted Discards May 1 - May 31**	**Predicted Landings June 1 - Feb 28**	**Predicted Discards June 1 - Feb 28**	**Predicted Landings Mar 1 - Apr 30**	**Predicted Discards Mar 1 - Apr 30**	**Total Modeled Landings**	**Total Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**	
SNEyt (no thld)	1,664	**250/750**	not achv	12	182	404	180	53	87	469	449	N/A	7,117	N/A	

Table 93 - Predicted TACs, trip limits, thresholds, landings, discards and DAS use for rebuilding alternative 2 under the constant mortality rebuilding strategy. Landings in metric tons.

5.2.6.4.3 Other Measures

This alternative builds on the measures implemented August 1, 2002. Those measures were analyzed in the EA that accompanied them, and pertinent parts of that analysis are repeated in Alternative 1. For those measures that can be quantified, the estimates from the EA will be combined with the closed area model to estimate reductions in fishing mortality.

A number of additional gear requirements are proposed in this alternative and the likely biological impacts are described below. Much of this discussion is moot if the TACs are appropriately set and effectively monitored, as the fishery for a species will close when the TAC is caught.

Trawl Gear Requirements

The proposed action requires the use of a haddock separator trawl or a flounder net on Georges Bank and in the area of the GOM inshore of 70W. The haddock separator trawl minimizes the catch of cod through a design which considers the behavior of fish in response to the gear. Generally, haddock swim to the upper part of a net and cod swim to the lower part of the net. By inserting a mesh panel in the net, and using two cod ends, the catch can be effectively divided. If the cod end on the lower part of the net is left open, the cod escape. This net has been in use for some time by Canadian vessels fishing on Georges Bank under a quota system. With low cod quotas, Canadian vessels have had to develop ways to minimize cod catch in order to take advantage of higher haddock quotas. A Canadian DFO project studied the effectiveness of a haddock separator trawl while conducting over 150 tows in 1990 and 1991. These experiments showed about 60% of the cod caught in the bottom of the trawl, with a range from 75 percent to 40 percent. Additional data was collected on pollock, silver hake, plaice, yellowtail, winter flounder, halibut, and mackerel. Nearly all pollock was caught in the top cod end, silver hake was split evenly between the two, and most flounders were caught in the bottom cod end. The report also notes that skates and sculpins were caught almost entirely in the bottom cod end and were nearly completely absent in the top cod end, though data were not reported on numbers and weights of these two species (DFO 1992). Engas et al. (1998) conducted experiments in Norwegian trawl fisheries using a separator panel and found similar results. 90 percent of the haddock were caught in the upper cod end, and between 60 and 70 percent of the cod were caught in the lower cod end. Engas et al. also noted some shifts in size selectivity, and commented that the height of the separator panel was critical and may differ from area to area. One Canadian fleet owner recently reported that when effectively tuned, the net caught 95 percent of the haddock in the top end and 60 percent of the cod in the lower end (which would be released with an open cod end) (d'Entremont, per. comm. 2002).

A large percentage – approximately 60 percent in recent years - of both GB and GOM cod is caught on trawl trips (see MSMC 2001, Appendix VI and Table 78). In the GOM, a large percentage is caught in the inshore areas (about 50 percent of the total is trawl caught in this area) that will require the use of this net (see Volume II). While the documented evidence is that 60 percent of the cod caught will be in the bottom half of the net and will escape, there may be some time until the appropriate height is determined for the panel in this area. Still, even if the panel is only half as effective as documented, the use of the panel could reduce GB cod catch by about 20 percent of the total catch and GOM cod by 15 - 30 percent of the total catch. There will likely be benefits as well to flounders, as the behavior of these fish is to stay low in the net, a trait used effectively in the design of the raised-footrope trawl. There is no documentation, however, on how effective this will be.

The impacts of the required flounder net are more difficult to analyze. A normal, two–seam flounder net without heavy ground gear can be used to target cod in certain areas. According to fishermen the net is not as effective as a traditional cod net, and may preclude vessels from fishing in some areas, depending on the design specified by the RA. Other flounder net designs, however, have proven very effective at minimizing cod catch. Two net designs tested by Massachusetts DMF – the so-called topless net and a net with a square mesh panel first designed by a local fisherman – were able to reduce cod catches by 70 to 90 percent (Carr et al. 2001).

This alternative also requires use of a raised footrope trawl in the area where most CC/GOM yellowtail flounder is caught. About 80 percent of CC/GOM yellowtail landings are by trawl gear. The raised footrope trawl has proven effective at reducing yellowtail landings, meeting the 5 percent exempted fishery standard in block 124 for a whiting fishery (see Framework 35). This option requires the net in specific thirty-minute blocks. Trawl landings from these blocks account for approximately 40 percent of the total CC/GOM yellowtail flounder landings. If the net reduces these landings by 95 percent, the expected reduction in exploitation would be about 38 percent, assuming that there is no shift of effort into the area. See section 5.2.6.3.5 for an additional discussion of this measure.

In summary:

- The haddock separator net may reduce GB cod catches by a conservative estimate of 20 percent of the total catch, but could range as high as 40 percent
- The separator trawl may reduce GOM cod overall catches by 15 to 30 percent.
- The required use of a flounder net may reduce cod catches, but it is uncertain how much until the required net design is identified by the RA.
- The raised footrope trawl could reduce total CC/GOM yellowtail flounder catches by approximately 40 percent.
- The impacts of these changes in trawl gear on other species are unknown.
- The attribution of catch reductions based on gear changes is somewhat speculative given the lack of documented results for some for some of the gear suggested.

Gillnets
The number of gillnets proposed (50) in the inshore area was analyzed in the EA. This alternative also prohibits use of tie-down gillnets in the primary stock area for CC/GOM yellowtail flounder. While gillnets catch 15 – 20 percent of the CC/GOM yellowtail flounder in this area, it is not known how the prohibition on tie-down nets will affect their catch. In addition, this may encourage gillnet fishermen to target cod or other roundfish, benefiting one stock while harming another.

Longlines
Longline vessels are limited to 1,000 hooks per day. This will have no significant impact on GOM stocks, as the longline fishery catches very little in this area. In GB, longline vessels are a key component of the cod fishery, taking between 10 and 20 percent of the catch in recent years. The number of hooks proposed is 22 percent of the hooks allowed under the no action alternative. A preliminary estimate, then, is that this alternative could reduce GB Cod catches by 80 percent of the longline catch, or 8 to 15 percent of the total cod catch.

5.2.6.4.4 Summary

The use of a hard TAC insures that this alternative will meet the biological objectives, though if fishing is permitted after the TAC is achieved (the zero-retention option) then TACs are likely to be exceeded. The other measures provide additional insurance that the TAC will not be rapidly exceeded. In addition, some changes could not be estimated but are believed to provide additional mortality benefits (prohibition on the use for gillnet tie-down nets in the certain areas in the GOM, for example). Both alternatives meet the mortality objectives for all stocks. In some cases, this alternative results in the least reduction on stocks (such as GB yellowtail and GB winter flounder) that do not need significant reductions.

The two tables that follow show a large gap between the expected biological impacts that result from the effort control measures in this alternative for SNE/MA yellowtail flounder, SNE/MA winter flounder, white hake, and witch flounder. This suggests that the TAC for these stocks will be the primary constraint on fishing mortality.

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks			Expected Reduction
		Constant F	Phased F	Adaptive	
GB Cod	0.38	53%	+13%	53%	59%
GOM Cod	0.47	53%	32%	51%	40%
GB Haddock	0.22	+14%	0%	NA	18%
GOM Haddock(1)	0.12	+83%	NA	+92%	17%
GB Yellowtail Flounder	0.13	+77%	NA	+92%	8%
Cape Cod/GOM Yellowtail Flounder	0.75	88%	3%	77%	67%
SNE/MA yellowtail flounder	0.91	80%	45%	71%	5%
American Plaice	0.43	65%	47%	60%	21%
Witch Flounder	0.45	67%(2)	67%(2)	67%(2)	21%
GOM Winter Flounder	0.14	NA	NA	NA	29%
GB Winter Flounder(1)	0.25	NA	NA	+28%	4%
SNE/MA Winter Flounder	0.51	51%	31%	37%	6%
Acadian Redfish	0.01	0%	0%	0%	0%
White Hake(1)	1.36	69%	69%*	60%	17%
Pollock(1)	3.55	NA	NA	+66%	18%
Windowpane Flounder (North)(1)	0.1	NA	NA	NA	11%
Windowpane Flounder (South)(1)	0.69	2%	2%	2%	
Ocean Pout	0.008	NA	NA	NA	
Atlantic Halibut	NA	NA	NA	NA	

Table 94 – Estimated mortality reductions under Alternative 2, first option for counting DAS in the Gulf of Maine, without application of hard TAC. This table illustrates the mortality reduction expected from the effort control measures in this alternative.

(1) Index based stocks
(2) Reduction needed to end overfishing

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks			Expected Reduction
		Constant F	Phased F	Adaptive	
GB Cod	0.38	53%	+13%	53%	55%
GOM Cod	0.47	53%	32%	51%	38%
GB Haddock	0.22	+14%	0%	NA	14%
GOM Haddock(1)	0.12	+83%	NA	+92%	6%
GB Yellowtail Flounder	0.13	+77%	NA	+92%	8%
Cape Cod/GOM Yellowtail Flounder	0.75	88%	3%	77%	67%
SNE/MA yellowtail flounder	0.91	80%	45%	71%	2%
American Plaice	0.43	65%	47%	60%	14%
Witch Flounder	0.45	67%(2)	67%(2)	67%(2)	7%
GOM Winter Flounder	0.14	NA	NA	NA	7%
GB Winter Flounder(1)	0.25	NA	NA	+28%	17%
SNE/MA Winter Flounder	0.51	51%	31%	37%	2%
Acadian Redfish	0.01	0%	0%	0%	
White Hake(1)	1.36	69%	69%*	60%	12%
Pollock(1)	3.55	NA	NA	+66%	11%
Windowpane Flounder (North)(1)	0.1	NA	NA	NA	11%
Windowpane Flounder (South)(1)	0.69	2%	2%	2%	
Ocean Pout	0.008	NA	NA	NA	
Atlantic Halibut	NA	NA	NA	NA	

Table 95 – Estimated mortality reductions under Alternative 2, second option for counting DAS in the Gulf of Maine, without application of hard TAC. This table illustrates the mortality reduction expected from the effort control measures in this alternative.

(1) Index based stocks
(2) Reduction needed to end overfishing

5.2.6.5 Alternative 3 – Area Management

This alternative adopts an area management approach. Until/unless implemented and new regulations are adopted for specific areas, the alternative layers an area-specific hard TAC system onto the measures implemented August 1, 2002. The combination of a hard TAC and the August 1, 2002 measures is analyzed in section 5.2.6.6.

5.2.6.5.1 Closed Area Model

The Closed Area Model (section 5.1.1) was used to estimate the economic impacts of the following elements of this alternative:

- Year round closed areas
- Seasonal closed areas
- Trip/possession limits
- Reductions in allocated DAS
- Application of hard TAC

The use of the closed area model differed from its use in the EA. For the measures implemented August 1, 2002, the EA assumed that because the total number of allocated DAS exceeded the DAS used in the previous fishing year, the reduction in allocated DAS would not have any impact on DAS use. Since May 1, 2002, DAS use has been about 60 percent of DAS use in the previous year (see Volume II), suggesting that the EA assumption on DAS use may have been incorrect. In this analysis, the reduction in allocated DAS is assumed to result in a similar reduction in used DAS. That is, the twenty percent reduction in allocated DAS is expected to result in a similar reduction in used DAS. This assumption appears valid based on DAS use in 2002 and 2003. In fishing year 2003, total DAS used declined by thirty-seven percent from the previous year. In fishing year 2003 to date, DAS use is running 16 percent higher than in 2002, which would result in a DAS reduction of about twenty-seven percent fro 2001 if that rate continues.

This alternative uses a hard TAC to ensure the biological objectives are met. The changes in exploitation that result from the closed area model without the hard TAC incorporated can be used to indicate the stocks for which the hard TAC is the primary mortality control (similar to what was done for Alternative 2).

	GOM	GB	SNE	Cape	Mid-Atlantic	All Loc
Cod	-18.9%	-8.9%				
Haddock	-13.1%	-10.0%				
Winter Fldr.	-15.5%	-10.5%	-0.1%			
Yellowtail		-6.6%		-13.8%	-14.9%	
Windowpane	-4.4%					
Plaice						-14.7%
Witch Fldr.						-11.8%
Pollock						-8.4%
Redfish						-11.7%
White Hake						-11.3%

Table 96 – Changes in exploitation for Alternative 3 without applying the hard TAC.

5.2.6.5.2 Additional Measures

This alternative extends the measures implemented August 1, 2002 that were analyzed in an EA accompanying the measures. The measures implemented August 1, 2002, and continued forward in this alternative, included:

- Changes in gear requirements: mesh size increases, changes in the number of gillnets, changes in the number of hooks and hook size, limits on the use of de-hooking devices, etc.
- Prohibition on front-loading of the DAS clock
- Changes to the large-mesh program
- Changes in minimum cod size

The most significant of these measures is the change in mesh size in almost all areas, coupled with the reductions in number of gillnets for various gillnet categories. The EA determined that the prohibition on front-loading of the DAS clock will have few impacts because of the restricted DAS levels. The mesh change will achieve, at best, an additional 10 percent reduction in mortality once equilibrium is achieved. The impacts of changes in gear requirements are explained in the previous section, and are relatively minor for most stocks.

5.2.6.5.3 Summary

The application of a hard TAC will achieve all biological objectives. One possible adverse outcome of the area and species specific TACs may result if areas are selected that do not align closely with stock boundaries. The catch of a species in an area may be a combination of several stocks. For example, under some alternatives, the Western Georges Bank area includes Cape Cod, Southern New England, and Georges Bank yellowtail flounder. These are combined into one yellowtail flounder TAC for the area. If fishing patterns focus on one stock of fish in an area, then it is theoretically possible to overfish one stock of yellowtail in this area while remaining below the overall species/area TAC. To some extent, this may be mitigated by the fact the calculation of the TAC takes into account – in a crude way – the distribution of fishing effort on each stock.

Similar to the other options that use a hard TAC, the following table shows the expected reduction in fishing mortality that results from the effort control measures that can be quantified. Once again, the difference between the expected reduction and the necessary reduction indicate the stocks where the TAC will be the primary constraint on fishing mortality. For this alternative, it is clear that the TAC is critical to achieving the biological objectives. This is consistent with the conclusion that the court-ordered measures, by themselves, are not sufficient to rebuild overfished stocks and thus those measures were rejected by the Council (absent a hard TAC – see section 4.2.2).

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks			Expected Reduction
		Constant F	Phased F	Adaptive	
GB Cod	0.38	53%	+13%	53%	26%
GOM Cod	0.47	53%	32%	51%	26%
GB Haddock	0.22	+14%	0%	NA	14%
GOM Haddock(1)	0.12	+83%	NA	+92%	13%
GB Yellowtail Flounder	0.13	+77%	NA	+92%	8%
Cape Cod/GOM Yellowtail Flounder	0.75	88%	3%	77%	21%
SNE/MA yellowtail flounder	0.91	80%	45%	71%	21%
American Plaice	0.43	65%	47%	60%	18%
Witch Flounder	0.45	67%(2)	67%(2)	67%(2)	13%
GOM Winter Flounder	0.14	NA	NA	NA	14%
GB Winter Flounder(1)	0.25	NA	NA	+28%	12%
SNE/MA Winter Flounder	0.51	51%	31%	37%	12%
Acadian Redfish	0.01	0%	0%	0%	
White Hake(1)	1.36	69%	69%*	60%	12%
Pollock(1)	3.55	NA	NA	+66%	12%
Windowpane Flounder (North)(1)	0.1	NA	NA	NA	4%
Windowpane Flounder (South)(1)	0.69	2%	2%	2%	
Ocean Pout	0.008	NA	NA	NA	
Atlantic Halibut	NA	NA	NA	NA	

Table 97 – Estimated mortality reductions under Alternative 3, without application of hard TAC. This table illustrates the mortality reduction expected from the effort control measures in this alternative.

5.2.6.6 Alternative 4 – Hard TAC

This alternative layers a hard TAC approach over effort controls. There are two options for effort controls: measures in place in fishing year 2001, and measures implemented August 1, 2002. The results are incorporated into the analysis of this approach using both the closed area model and the hard TAC/trip limit models. These models attempt to quantify impacts differently; both sets of results are reported and, while they differ in magnitude, the direction of the impacts is essentially the same.

5.2.6.6.1 Closed Area Model Results

The closed area model (GAMS, section 5.1.1) was used to estimate the economic impacts of the following elements of this alternative:

- Year round closed areas
- Seasonal closed areas
- Trip/possession limits
- Reductions in allocated DAS
- Application of hard TAC

The use of the closed area model differed from its use in the EA. For the measures implemented August 1, 2002, the EA assumed that because the total number of allocated DAS exceeded the DAS used in the previous fishing year, the reduction in allocated DAS would not have any impact on DAS use. Since May 1, 2002, DAS use has been about 60 percent of DAS use in the previous year (see Volume II), suggesting that the EA assumption on DAS use may have been incorrect. In this analysis, the reduction in allocated DAS is assumed to result in a similar reduction in used DAS. Thus, this analysis may be a best-case scenario.

The modeling of a hard TAC also created difficulties for the use of the model. In essence, the TAC was assigned to each vessel according to its past catch history, and a vessel stopped fishing for that species when its allocation was caught. Even though the hard TAC should assure that the biological objectives are met, the model was run both to help in the analysis of distributive impacts and to see how overall mortality might be affected.

The use of hard TACs to insure the objectives are met eliminates the need to estimate the impacts of this alternative. Changes in exploitation, and a summary table of the biological impacts, are not presented for this reason.

5.2.6.6.2 Additional Measures

This alternative extends the measures implemented August 1, 2002 that were analyzed in an EA accompanying the measures. The measures implemented August 1, 2002, and continued forward in this alternative, include:

- Changes in gear requirements: mesh size increases, changes in the number of gillnets, changes in the number of hooks and hook size, limits on the use of de-hooking devices, etc.
- Prohibition on front-loading of the DAS clock
- Changes to the large-mesh program
- Changes in minimum cod size

The most significant of these measures is the change in mesh size in almost all areas, coupled with the reductions in number of gillnets for various gillnet categories. The EA determined that the prohibition on front-loading of the DAS clock will have few impacts because of the restricted DAS levels. The mesh change will achieve, at best, an additional 10 percent reduction in mortality once equilibrium is achieved. The impacts of changes in gear requirements are explained in the previous section, and are relatively minor for most stocks.

5.2.6.6.3 Hard TAC/Trip Limit Model Results

The hard TAC/trip limit model was applied to the measures in rebuilding alternative 4 to attempt to capture the derby impacts associated with hard TAC fisheries, and to quantify the impacts of trip limits that take effect once a portion of a TAC is reached. These impacts are well documented in the literature (for example, Morgan 1997). This model is more accurately tuned to the specifications of the rebuilding alternatives in that it accounts for increased fishing pressures early in the fishing year, and estimates trip limits and consequent discards that correspond to the TAC thresholds specified in the management measures. Because the model is based on actual fishing behavior from FY 2001, it does not account for changes in fishing practices that may occur as TACs are reached and trip limits are instituted; this is a major advantage of the closed area model (above).

The hard TAC/trip limit model was run two ways for rebuilding alternative 4. The first assumes that effort controls (DAS) in place in FY 2002 are utilized, while the second assumes that effort controls (DAS) in place in FY 2001 are utilized. The principal difference is the lower trip limits that result from the great DAS allocations under the FY 2001 effort control measures.

GOM haddock, GB haddock, Pollock, redfish, GOM winter flounder, GB winter flounder, northern and southern windowpane flounder, GB yellowtail flounder and witch flounder are not predicted to reach the TAC threshold. If the option to close a stock area once TACs are achieved for a particular stock is selected, alternative 4 may meet biological objectives (though areas could be closed as soon as one week into the fishing year). However, if retention of impacted species is prohibited, analysis indicates that TACs may be legally exceeded by large amounts. For example, under the constant mortality rebuilding strategy, discards after the TAC is reached may be as much as 2.5 times the TAC itself.

		70% Threshold							90% Threshold						
Stock	**2004 F_Rebuild TAC**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**
GOM cod	2,663	**120 lbs**	Sep	2,111	552	1,610	30,380	7,723	**30 lbs**	Aug	2,419	244	1,561	30,380	10,887
GB cod	2,747	**95 lbs**	Jul	1,985	761	6,393	29,947	3,754	**30 lbs**	Jul	2,481	260	5,710	29,947	5,119
white hake	3,199	**565 lbs**	Jan	2,757	443	690	15,292	7,068	**605 lbs**	Jan	3,072	126	374	15,292	9,559
SNE winter fl	2,239	**155 lbs**	Sep	1,634	596	1,526	18,189	3,911	**55 lbs**	Sep	2,023	216	1,204	18,189	5,540
CCGOM yellowtail	235	**0 lbs**	May	386	0	1,919	17,261	709	**0 lbs**	May	0	386	1,919	17,261	709
SNE/MA yellowtail fl	645	**0 lbs**	May	668	0	312	7,117	290	**0 lbs**	May	0	668	312	7,117	290
Am. plaice	2,311	**95 lbs**	Sep	1,762	547	2,092	32,624	8,971	**35 lbs**	Sep	2,104	207	2,079	32,624	11,636

Table 98 – Predicted TACs, trip limits, thresholds, landings, discards and DAS use for rebuilding alternative 4 under the constant mortality rebuilding strategy; FY 2002 effort control measures.

		70% Threshold							90% Threshold						
Stock	**2004 Phased_F TAC**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**	**Trip limit (per day)**	**Month TAC Achieved**	**Modeled Landings**	**Modeled Discards**	**Total discards under zero retention option**	**# DAS observed on stock**	**# DAS to threshold**
GOM cod	3,732	**235 lbs**	Nov	3,198	534	1,132	30,380	11,750	**120 lbs**	Nov	3,477	255	1,025	30,380	15,722
GB cod	5,920	**335 lbs**	Oct	4,651	1,267	3,804	29,947	10,145	**180 lbs**	Oct	5,427	492	3,294	29,947	14,064
white hake	3,199	**565 lbs**	Jan	2,757	443	690	15,292	7,068	**605 lbs**	Jan	3,072	126	374	15,292	9,559
SNE winter fl	3,011	**275 lbs**	Dec	2,342	669	941	18,189	5,820	**170 lbs**	Dec	2,768	243	602	18,189	8,612
CCGOM yellowtail	1,482	**115 lbs**	Aug	1,127	346	1,057	17,261	4,069	**45 lbs**	Aug	1,347	131	998	17,261	5,618
SNE/MA yellowtail fl	1,664	**265 lbs**	Apr	1,369	257	876	7,117	819	**135 lbs**	Sep	1,532	130	706	7,117	1,351
Am. plaice	3,391	**230 lbs**	Dec	2,847	542	1,130	32,624	13,739	**190 lbs**	Nov	3,171	219	938	32,624	18,906

Table 99 – Predicted TACs, trip limits, thresholds, landings, discards and DAS use for rebuilding alternative 4 under the phased F rebuilding strategy; FY 2002 effort control measures.

Stock	2004 F_Rebuild TAC	70% Threshold: Trip limit (per day)	Month TAC Achieved	Modeled Landings	Modeled Discards	Total discards under zero retention option	# DAS observed on stock	# DAS to threshold	90% Threshold: Trip limit (per day)	Month TAC Achieved	Modeled Landings	Modeled Discards	Total discards under zero retention option	# DAS observed on stock	# DAS to threshold
GOM cod	2,663	**60 lbs**	Sep	1,997	666	1,719	30,380	7,723	**10 lbs**	Aug	2,405	258	1,622	30,380	10,887
GB cod	2,747	**60 lbs**	Jul	1,963	782	6,239	29,947	3,754	**15 lbs**	Jul	2,477	264	5,734	29,947	5,119
white hake	3,199	**150 lbs**	Jan	2,438	760	1,204	15,292	7,068	**50 lbs**	Jan	2,911	286	850	15,292	9,559
SNE winter fl	2,239	**80 lbs**	Sep	1,605	627	1,610	18,189	3,911	**25 lbs**	Sep	2,019	220	1,236	18,189	5,540
CCGOM yellowtail	235	**0 lbs**	May	386	0	1,919	17,261	709	**0 lbs**	May	386	0	1,919	17,261	709
SNE/MA yellowtail fl	645	**0 lbs**	May	668	0	312	7,117	290	**0 lbs**	May	668	0	312	7,117	290
Am. plaice	2,311	**45 lbs**	Sep	1,691	620	2,365	32,624	8,971	**15 lbs**	Sep	2,090	221	2,202	32,624	11,636

Table 100 – Predicted TACs, trip limits, thresholds, landings, discards and DAS use for rebuilding alternative 4 under the constant mortality rebuilding strategy; FY 2001 effort control measures.

Stock	2004 Phased_F TAC	70% Threshold: Trip limit (per day)	Month TAC Achieved	Modeled Landings	Modeled Discards	Total discards under zero retention option	# DAS observed on stock	# DAS to threshold	90% Threshold: Trip limit (per day)	Month TAC Achieved	Modeled Landings	Modeled Discards	Total discards under zero retention option	# DAS observed on stock	# DAS to threshold
GOM cod	3,732	**80 lbs**	Dec	2,855	877	1,384	30,380	11,750	**25 lbs**	Nov	3,386	346	1,178	30,380	15,722
GB cod	5,920	**130 lbs**	Oct	4,361	1,557	4,371	29,947	10,145	**45 lbs**	Oct	5,353	567	3,308	29,947	14,064
white hake	3,199	**150 lbs**	Jan	2,438	760	1,204	15,292	7,068	**50 lbs**	Jan	2,911	286	850	15,292	9,559
SNE winter fl	3,011	**110 lbs**	Dec	2,219	790	1,057	18,189	5,820	**40 lbs**	Dec	2,727	283	691	18,189	8,612
CCGOM yellowtail	1,482	**55 lbs**	Aug	1,090	381	1,165	17,261	4,069	**20 lbs**	Aug	1,340	137	1,073	17,261	5,618
SNE/MA yellowtail fl	1,664	**170 lbs**	Apr	1,297	294	294	7,117	819	**75 lbs**	Sep	1,518	146	271	7,117	1,351
Am. plaice	3,391	**70 lbs**	Dec	2,558	832	1,705	32,624	13,739	**25 lbs**	Nov	3,074	316	1,416	32,624	18,906

Table 101 - Predicted TACs, trip limits, thresholds, landings, discards and DAS use for rebuilding alternative 4 under the phased F rebuilding strategy; FY 2001 effort control measures.

5.2.6.6.4 Summary

The use of a hard TAC insures the biological objectives are met for all stocks. If the TAC is applied to the measures in Alternative 2 (as a hard TAC backstop), the analysis of the impacts in section 5.2.6.4 shows the stocks for which the TAC is the primary mortality control. If the TAC is used with the FW 33 court-ordered measures, section 5.2.6.5 shows similar information. If the TAC is applied to the no action management measures, the TAC becomes the primary restriction on mortality for all stocks that need a reduction. The following tables shows the expected mortality reductions that will result if the TAC is applied to the FW33 court ordered measures.

Stock	2001 Fishing Mortality	Needed Reduction 2014 Rebuilding Date for Most Stocks			Expected Reduction
		Constant F	Phased F	Adaptive	
GB Cod	0.38	53%	+13%	53%	64%
GOM Cod	0.47	53%	32%	51%	70%
GB Haddock	0.22	+14%	0%	NA	47%
GOM Haddock(1)	0.12	+83%	NA	+92%	55%
GB Yellowtail Flounder	0.13	+77%	NA	+92%	1% increase
Cape Cod/GOM Yellowtail Flounder	0.75	88%	3%	77%	92%
SNE/MA yellowtail flounder	0.91	80%	45%	71%	86%
American Plaice	0.43	65%	47%	60%	72%
Witch Flounder	0.45	67%(2)	67%(2)	67%(2)	66%
GOM Winter Flounder	0.14	NA	NA	NA	43%
GB Winter Flounder(1)	0.25	NA	NA	+28%	68%
SNE/MA Winter Flounder	0.51	51%	31%	37%	59%
Acadian Redfish	0.01	0%	0%	0%	
White Hake(1)	1.36	69%	69%*	60%	71%
Pollock(1)	3.55	NA	NA	+66%	41%
Windowpane Flounder (North)(1)	0.1	NA	NA	NA	59%
Windowpane Flounder (South)(1)	0.69	2%	2%	2%	
Ocean Pout	0.008	NA	NA	NA	NA
Atlantic Halibut	NA	NA	NA	NA	NA

Table 102 - Estimated mortality reductions under Alternative 4 with a hard TAC and the FW 33 court-ordered measures (closed area model).

5.2.6.7 Recreational Fishing Measures

The biological impacts of the proposed recreational fishing measures are presented in this section. At present, recreational harvest is only included in the estimates of fishing mortality for GOM cod and SNE/MA winter flounder. The proposed measures focus on reducing cod catch, so the following analysis focuses on the impacts on GOM and GB cod. The impacts on haddock stocks are also of interest, but the recreational data for haddock catches is sparse.

The biological impacts of the recreational measures were estimated using a simulation model of recreational trips where Atlantic cod were harvested (MRFSS Type A+B1 catch) by stock area. Data included landings distributions by catch class (numbers of fish harvested) and size class by stock area and mode (party/charter and combined private boat and shore). The harvest distributions were estimated from pooled 1998-2000 weighted average MRFSS data (see Figure 121 through Figure 128). For any given trip, the harvest distribution describes the number of cod that may be retained and the size distribution provides an estimate of the size composition of retained catch. By repeatedly sampling from the harvest distribution and applying the size distribution the expected value (or average) of numbers of cod harvest per trip and the average size is obtained. Further, by applying a length-weight equation, the average weight of harvested cod can also be estimated. Given these averages, total harvest in numbers can then be calculated by multiplying average harvest by total number of trips. Total harvest by weight can be similarly calculated.

The proposed action adopts Option 3.

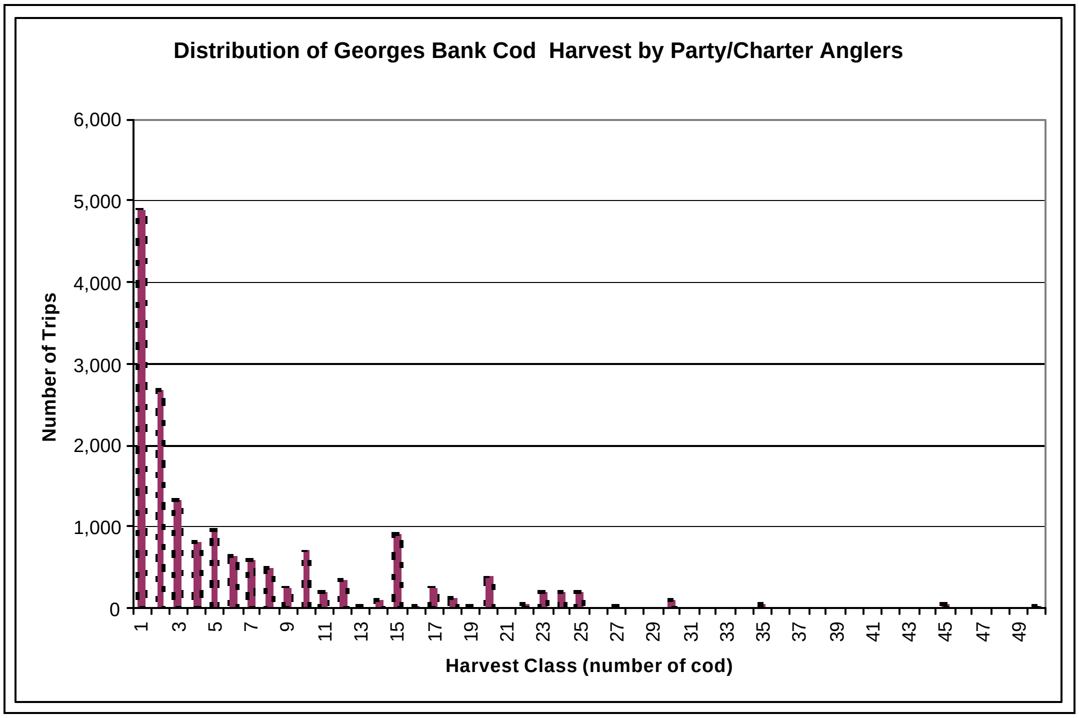


Figure 121 – Harvest distribution, GB cod, party/charter anglers

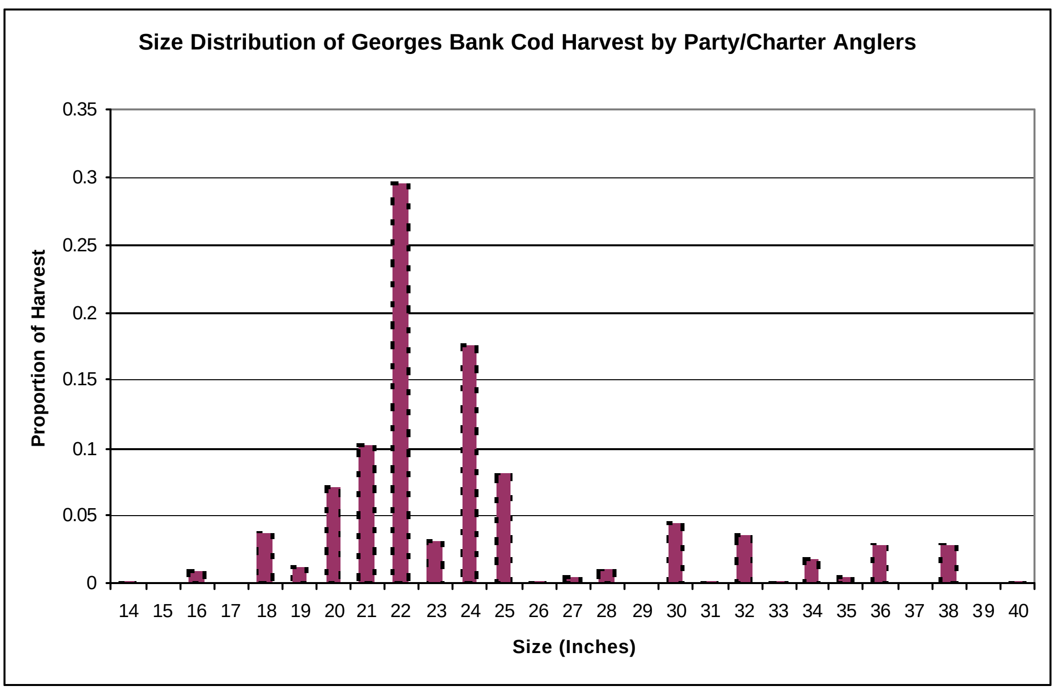


Figure 122 – Size distribution, GB cod, party/charter anglers

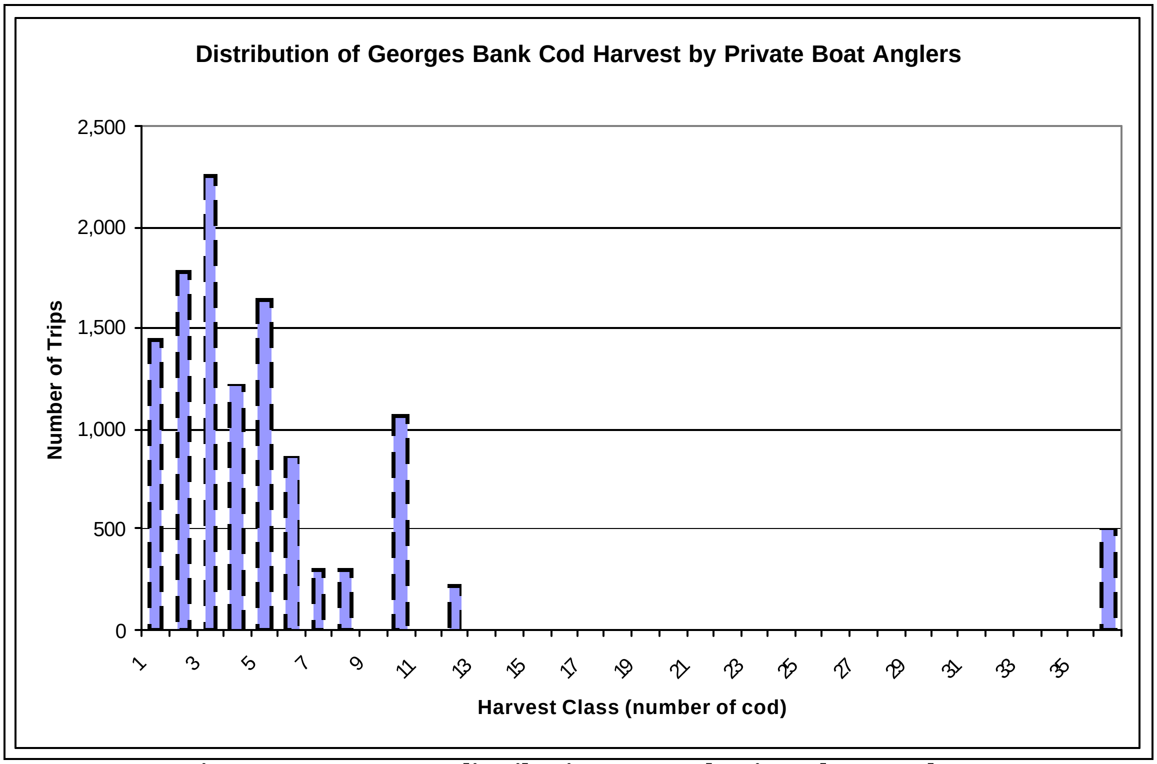


Figure 123 – Harvest distribution, GB cod, private boat anglers

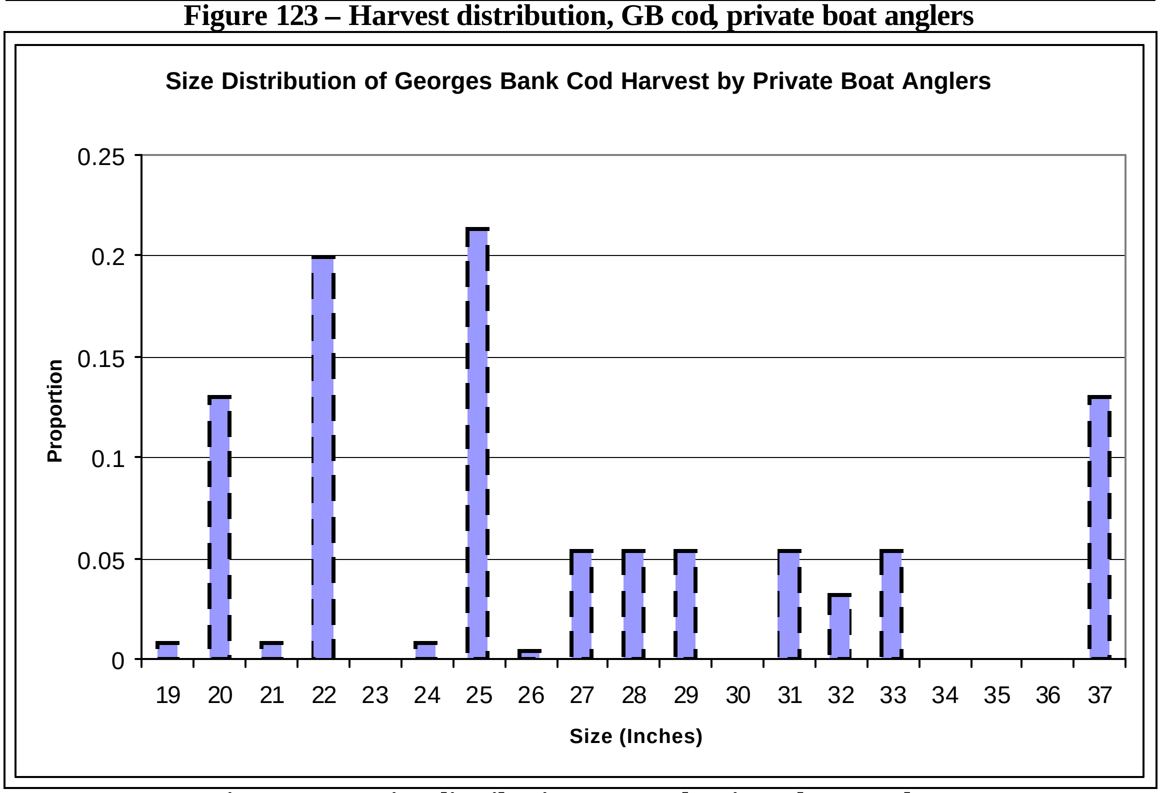


Figure 124 – Size distribution, GB cod, private boat anglers

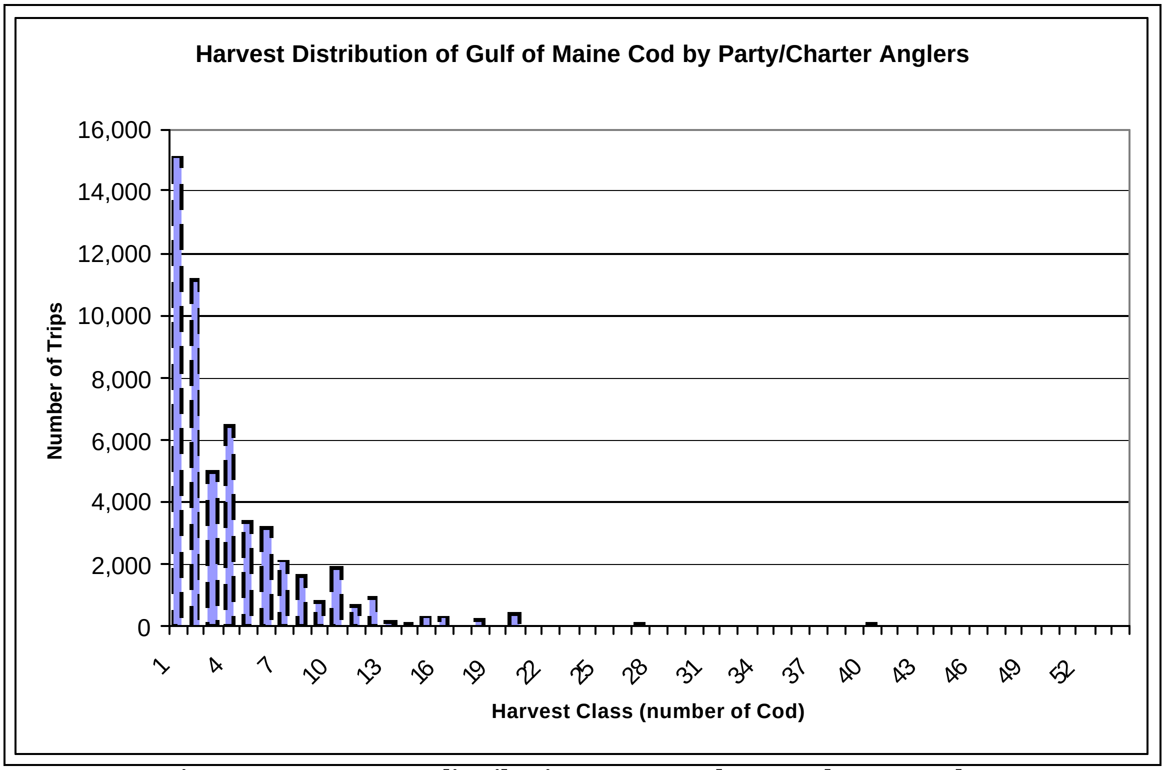


Figure 125 – Harvest distribution, GOM cod, party/charter anglers

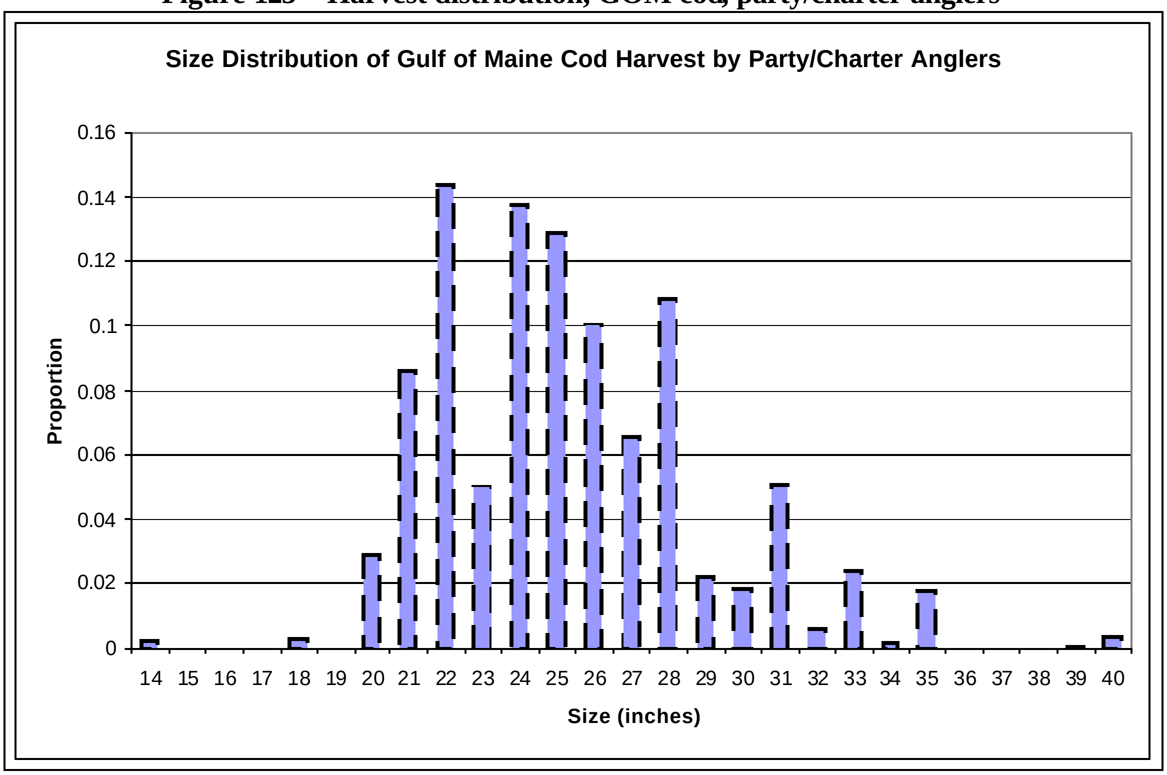


Figure 126 – Size distribution, GOM cod, party/charter anglers

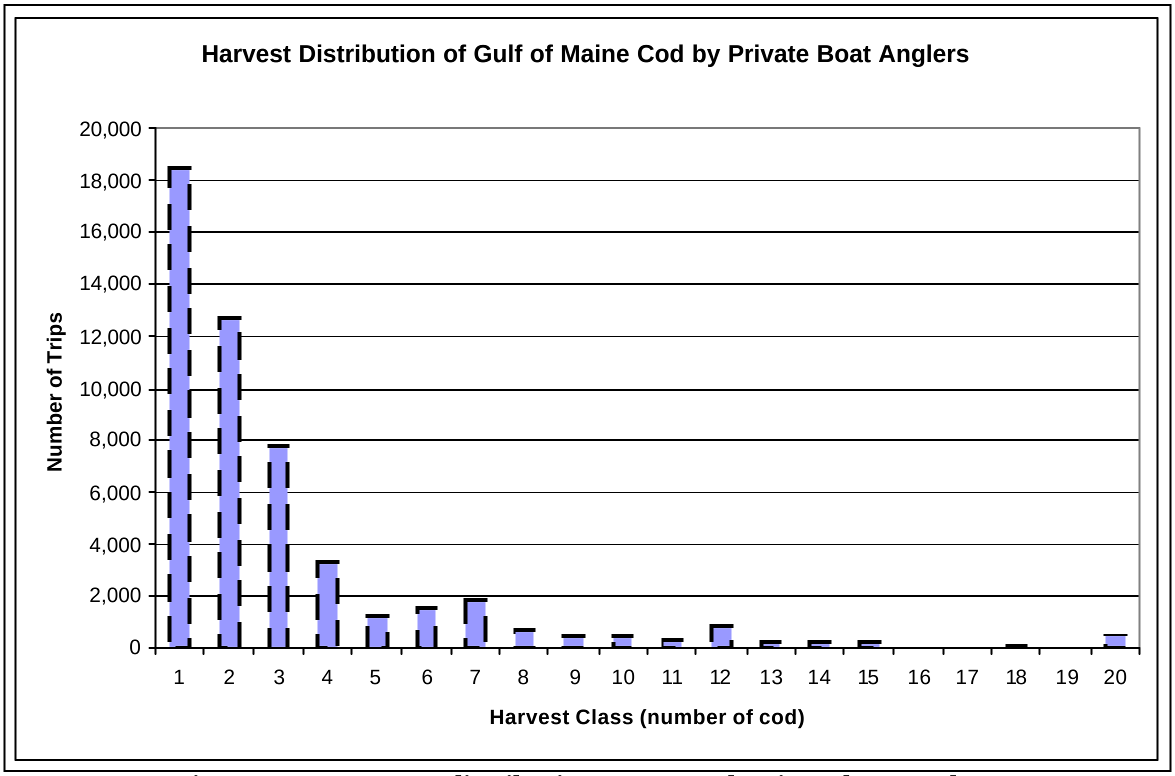


Figure 127 – Harvest distribution, GOM cod, private boat anglers

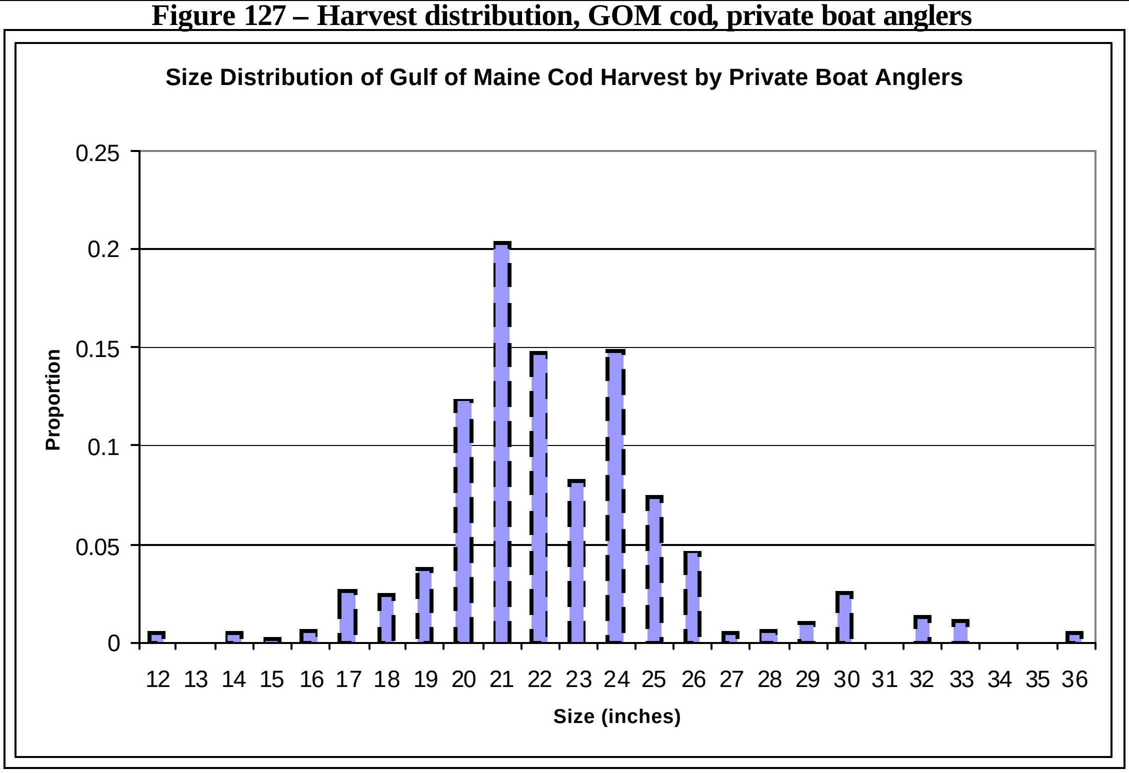


Figure 128 – Size distribution, GOM cod, private boat anglers

Bag and size limits affect change the numbers of cod that may be retained. Assuming perfect compliance and zero release mortality, a change in either bag or size limits results in a truncation of the harvest distribution or size distribution or both. By repeatedly sampling from the truncated distributions a new average catch, average size, and weight results. The biological impact of the new limits may then be measured by comparing the total harvest with and without the limit.

The observed harvest and size distributions for recreationally harvested cod indicate varying levels of conformance with Federal regulations in effect for the 1998-2000 time period by stock and mode. Approximately 17% of the Georges Bank cod party/charter harvest was not in conformance with Federal size regulations while 10% of private boat harvest was above the bag limit or under the size limit or both. Party/charter harvest in the Gulf of Maine had the lowest rate of non-compliance with Federal regulations while private boat harvest had the highest rate of non-compliance (25%). To the extent that these conformance rates continue, the biolo gical benefits of any more restrictive recreational measures may be compromised. These biological benefits may also be further compromised as release mortality is not likely to be zero.

To account for non-compliance rates and release mortality three scenarios were developed. First, maximum biological benefit would be realized if compliance rates were 100% and release mortality were zero. This scenario provides an upper bound estimate of biological benefit. A lower bound estimate was obtained under the assumption that observed non-compliance rates would continue and release mortality were 50%. An intermediate scenario was developed where non-compliance rates were assumed to be improved y 50% and release mortality was assumed to be 25%. In addition to these considerations, the proposed recreational restrictions may result in a reduction in demand for recreational fishing trips.

To account for possible changes in trips directing on Atlantic cod, the total number of trips that would be affected by either a trip limit, bag limit or both were estimated from the observed (1998-2000) harvest distributions. To be affected by a recreational measure does not necessarily mean that a given angler will no longer take a fishing trip or that cod will not be targeted. However, some response to more restrictive recreational regulation may be expected, at least in the short term. To develop some measure of this effect, a sensitivity analysis was conducted assuming that 25% and 50% of affected cod trips would not be taken. Note that these possible changes in number of trips were also used to form the basis for assessing the economic impacts of the proposed recreational fishing options in Section 5.4.7.

Results

A baseline for measuring the biological impacts of the recreational options was developed by simulating 1998-2000 average conditions including observed non-conformance rates and applying the resulting average harvest to the observed number of trips taken by stock and mode. Regardless of fishing mode, this simulated baseline tended to overestimate the observed number of cod harvest by approximately 6% and 12% for Georges Bank and Gulf of Maine cod respectively (Table 103).

	1998-2000 Average Number of Trips	Simulated Average Number of Cod Harvest per Trip	Simulated Total Harvest	Observed Harvest	Difference
Georges Bank Party/Charter	16,577	6.6	109,492	103,218	6.1%
Georges Bank Private Boat	11,576	6.0	69,995	65,895	6.2%
Gulf of Maine Party/Charter	53,778	4.4	237,521	214,051	11.0%
Gulf of Maine Private Boat	50,729	3.4	174,417	155,560	12.1%

Table 103 - Simulation baseline results for recreational measure analysis

Option 1 – This option was not selected. Assuming no change in number of trips harvesting cod the upper bound estimate of biological impact was a reduction of 47.8 and 37.1% respectively for Georges Bank and Gulf of Maine cod in terms of numbers (Table 104). The lower bound estimate was a reduction of 20.4 and 15.3% respectively. In terms of weight, the option 1 measures would reduce from a high of 29.8% to a low of 12.8% for Georges Bank cod. For Gulf of Maine cod the estimated reduction in total weight ranged from 24.8 to 10.3%. Note that the Option 1 biological benefits may be underestimated because the impact of the seasonal bag limit of 5-cod per angler from December to March could not analyzed since the MRFSS survey is conducted in two-month waves and January and February are not sampled in the New England states. Recreational effort during the December to March time period has historically been low, the underestimate of the Gulf of Maine cod biological benefits is likely to be small.

	Georges Bank		Gulf of Maine	
Scenario	Numbers	Weight	Numbers	Weight
No Reduction in Affected Trips*				
Upper Bound	-47.8%	-29.8%	-37.1%	-24.8%
Intermediate Bound	-33.2%	-20.8%	-25.4%	-17.0%
Lower Bound	-20.4%	-12.8%	-15.3%	-10.3%
25% Reduction in Affected Trips				
Upper Bound	-50.7%	-33.6%	-42.5%	-31.3%
Intermediate Bound	-37.0%	-25.1%	-31.8%	-24.2%
Lower Bound	-25.0%	-17.6%	-22.6%	-18.1%
50% Reduction in Affected Trips				
Upper Bound	-53.5%	-37.4%	-48.0%	-37.8%
Intermediate Bound	-40.8%	-29.4%	-38.3%	-31.4%
Lower Bound	-29.5%	-22.3%	-30.0%	-25.9%
* 6,400 affected trips for Georges bank cod and 36,500 affected trips for Gulf of Maine cod.				

Table 104 – Recreational measures Option 1 biological impacts for Atlantic cod

If anglers decide to reduce the number of trips where cod was targeted the biological impacts would be greater as fewer fish would be caught and subject to release mortality or illegal retention. A reduction in number of trips that would have been affected by one or more of the Georges Bank cod measures would increase the biological impacts on Georges Bank cod by 3-5% or 4-9% depending the assumed reduction in trips. A reduction in trips harvesting cod would improve the biological impact on Gulf of Maine cod by 5 to 15% in terms of numbers of cod and from 7 to 16% in terms of weight.

Option 2 – This option was not selected. Option 2 would implement the same Georges Bank cod measures as that of Option 1. Therefore, the estimated Georges Bank cod biological impacts were unchanged. However, Option 2 would implement a seasonal closure on Gulf of Maine cod but not Georges Bank cod. To avoid this closure anglers may switch to targeting of Georges Bank for the duration of the closed season. In this event the Gulf of Maine closure could increase recreational effort directed on Georges Bank cod and could have a negative impact on that cod stock. Note that imposition of a bag limit on party/charter anglers in the Gulf of Maine while having no limit on Georges Bank cod may have a similar effect, as party/charter anglers may switch to Georges Bank.

The biological impact of Option 2 would be greater than that of Option 1 because of the closed season. With a closed season, fish are not subject to being caught, and so, are also not subject to release mortality. The reduction in number of trips was estimated the sum of 50% of the total number of Gulf of Maine cod trips taken in MRFSS wave-2 (March-April) and 50% of the total number of cod trips taken in wave-6 (November-December); 14,700 trips.

Across all scenarios, Option 2 would reduce Gulf of Maine cod harvest by at least 28.3% in terms of numbers and 25.3% in terms of total weight. The estimated upper bound impact was as much as a 54.3% reduction (Table 105).

	Georges Bank		Gulf of Maine	
Scenario*	**Numbers**	**Weight**	**Numbers**	**Weight**
No Reduction in Affected Trips**				
Upper Bound	-47.8%	-29.8%	-47.5%	-37.8%
Intermediate Bound	-33.2%	-20.8%	-37.2%	-31.1%
Lower Bound	-20.4%	-12.8%	-28.3%	-25.3%
25% Reduction in Affected Trips				
Upper Bound	-50.7%	-33.6%	-50.9%	-41.8%
Intermediate Bound	-37.0%	-25.1%	-41.3%	-35.5%
Lower Bound	-25.0%	-17.6%	-33.1%	-30.1%
50% Reduction in Affected Trips				
Upper Bound	-50.9%	-41.8%	-54.3%	-45.7%
Intermediate Bound	-41.3%	-35.5%	-45.4%	-39.9%
Lower Bound	-33.1%	-30.1%	-37.8%	-34.9%

* 6,400 affected trips for Georges bank cod and 26,600 affected trips for Gulf of Maine cod that are not affected by the closed season.

** All scenarios include reduction of 14,700 trips due to closed season.

Table 105 – Recreational measures Option 2 biological impacts

Option 3 – This option is the proposed action. Option 3 would implement a lower size limit than either Option 1 or Option 2 and would change the trip limit in the Gulf of Maine to a limit based on number of cod per person per day. The impact of implementing the Gulf of Maine cod bag as a per person per day could not be evaluated using available data. The MRFSS data is based on an angler-trip and does not take into account the duration of the trip. The party/charter VTR data were queried to identify the frequency of reported trips that would meet the proposed criteria (a trip of more than 15 hours and covering two consecutive calendar days). This query resulted in almost no trips that met these criteria taken by Gulf of Maine party/charter vessels. This does not necessarily mean that overnight party/charter trips do not occur, but it does appear to be common.

The biological impact of Option 3 would be lower for both Georges Bank and Gulf of Maine cod under all scenarios (Table 106). Unlike Options 1 and 2 there were no scenarios where the estimated change in recreational cod harvests were commensurate with that of the estimated commercial reductions needed to achieve the conservation objectives for either cod stock. Given the proposed change in the Gulf of Maine cod bag limit the conservation benefits may be overestimated since the proposed measure is likely to provide an incentive for party/charter operators to change their trip scheduling to take advantage of the higher keep that a daily bag would provide.

	Georges Bank		Gulf of Maine	
Scenario	**Numbers**	**Weight**	**Numbers**	**Weight**
No Reduction in Affected Trips*				
Upper Bound	-25.1%	-16.6%	-26.0%	-17.0%
Intermediate Bound	-17.5%	-11.7%	-17.7%	-11.7%
Lower Bound	-10.8%	-7.3%	-10.6%	-7.0%
25% Reduction in Affected Trips				
Upper Bound	-27.2%	-18.7%	-29.0%	-20.4%
Intermediate Bound	-19.8%	-13.8%	-21.1%	-15.3%
Lower Bound	-13.2%	-9.5%	-14.3%	-10.8%
50% Reduction in Affected Trips				
Upper Bound	-29.2%	-20.7%	-32.1%	-23.7%
Intermediate Bound	-22.0%	-15.9%	-24.5%	-18.9%
Lower Bound	-15.6%	-11.7%	-18.1%	-14.6%
* 2,900 affected trips for Georges bank cod and 18,000 affected trips for Gulf of Maine cod.				

Table 106 – Recreational measures Option 3 biological impacts for Atlantic cod

5.2.7 Other Issues

5.2.7.1 Northern Shrimp Fishery Exemption Area

The proposed action eliminates the area restriction for the northern shrimp fishery.

5.2.7.1.1 Background

The northern shrimp fishery is managed by an Interstate Fishery Management Plan implemented by the Atlantic States Marine Fisheries Commission (ASMFC). Major management measures adopted by the ASMFC include a minimum mesh size of 1 and 7/8 inches, the requirement to use a finfish excluder device (Nordmore grate), and seasonal restrictions on fishing activity that are adjusted each year. In addition, because the minimum mesh size is less than that specified in the Northeast Multispecies Plan, the Council established an exempted fishery for northern shrimp that allows this fishery to take place. The exempted fishery requirements include restrictions on allowable incidental catch and limits on the area that can be fished.

Most of the landings for this fishery are made by offshore trawlers. Landings averaged over 11,000 mt from 1969-1972, but then declined to 400 mt in 1977. In recent years, landings peaked at 9,200 mt in 1996, but declined over the next three years to 1,816 mt in 1999. Landings increased slightly to 2,390 mt in 2000. Trends in landings have been determined primarily by recruitment of strong year classes. For the past eight years, seasonal trends in the offshore fishing effort have been evaluated. Mature female shrimp move inshore in early winter and offshore following larval hatching. Seasonal shifts in effort, however, may also be due to changes in fishermen's choices for targeting concentrations of shrimp. The pattern of inshore/offshore fishing shows considerable variability over the last eight years (Armstrong et al. 2000).

The Northern Shrimp Technical Committee (NSTC) assessed the resource in October, 2000 and again in October, 2001. Fishing in the 2000 season was limited to a 51 day season that began January 17, 2000 and ended March 15, 2000. Various catch per unit effort indices (CPUE) all showed increases in the 2000 season, reversing declines noted from 1996 to 1998. The 2000 CPUE based on logbook data was similar to the levels noted in 1995 and 1997, while the CPUE based on information collected from Maine and New Hampshire port sampling programs was the highest on record. The number of trips in 2000 showed a decline from 1999 and was about 28% of the number of trips in the 1996 season (Armstrong et al. 2000).

The NSTC noted in October 2000 that all resource indices are well below historic levels, but show a turn-around from the decline seen since 1996. The NSTC believes the sharp reduction in landings in recent years has resulted in a relatively low fishing mortality and has stabilized population abundance. The stock is estimated to be at 7,400 mt, compared to the average 1985-1995 biomass of 16,600 mt, and recruitment continues to be below the time series average. Exploitable biomass increased about 21% from 1999. While the 1999 year class appears strong, the 1997 and 1998 year classes remain below average. The NSTC suggested stock rebuilding may slow or cease if landings are allowed to rise sharply. The NSTC recommended a 61-day season for 2001, targeting an increase in landings to 2,850 mt. The ASMFC's Northern Shrimp Section considered the advice of the NSTC and industry comments and approved an 83-day season.

Fishing in 2001 was increased to an 83 day season, composed of an open period January 9, 2001 through March 17, 2001, and a spring season between April 16 and April 30. Landings declined to 1,083 tones, the lowest since 1983. The proportion of landings from New Hampshire more than doubled from the previous year. CPUE declined to 771 pounds per trip, the lowest since 1993, based on logbook data. In general, CPUE has been dropping since 1996, with the exception of the 2000 season (Glenn et al. 2001).

In October 2001, the NSTC concluded that the abundance of shrimp, as measured by the state/federal survey, analytic models, and landings and CPUE information, is at or near its lowest level since the early 1980s following the stock collapse in the 1970s. There have been recruitment failures in three of the last four year classes. Only the 1999 year class is relatively strong as compared to the 1996 year class that supported lower than average landings in 1999, 2000, and 2001. The NSTC recommended that no fishing be conducted in the 2002 season. The Northern Shrimp Section of ASMFC, however, chose to allow a 25 day season in order to maintain markets and infrastructure of the fishery, as well as provide some opportunities for shrimp fishermen.

In October, 1999, NMFS advised the Council that northern shrimp were approaching an overfished condition and directed the Council to develop measures for this fishery by October 28, 2000. The Council notified NMFS that because the ASMFC was active in shrimp management and was beginning to develop an amendment to its shrimp plan, the Council did not intend to develop management measures for shrimp. NMFS accepted this reply but cautioned the Council to closely monitor ASMFC progress to ensure appropriate action. In January, 2001, the NMFS again reported to Congress that northern shrimp is approaching an overfished condition (NMFS 2001a). The ASMFC continues to develop its amendment, with tentative plans to review it for approval in October, 2001. The NSTC will update the stock assessment in fall, 2001.

Because northern shrimp is managed by the ASMFC, the Council assumes that any action necessary to protect the shrimp resource will be taken by that group. This includes any adjustments to the ISFMP necessary because the area allowed for the fishery is increased. For that reason, the following analysis of biological impacts focuses on the impacts of the proposed options on groundfish stocks.

As background for this analysis, the results of an experiment conducted by the Maine Department of Marine resources in April through May, 2001 are briefly described (excerpted from the Executive Summary of the Report). The full report of this experiment is in Appendix III. The goal of this experiment was to determine whether a shrimp fishery can be conducted southeast of the Loran 25600 line within acceptable bycatch limits in order to provide additional economic opportunity to the shrimp fleet and alleviate pressure on shrimp in inshore waters.

During May, 2001, six commercial shrimp vessels completed two trips each of three days duration (except for one vessel trip curtailed by equipment failure) in waters southeast of the Loran 25600 line in the vicinity of Cashes Ledge (west to 69°40'W, east to 68°30'W, south to 42°30'N). The vessels completed a total of 132 commercial tows (average length of approximately 2 hours) with a 1" Nordmore grate and 24 control tows (average length of approximately 30 minutes) without the grate. Key findings were as follows:

Data summary:	132 Tows with Grate	24 Control Tows without Grate
Total catch (lbs.)	79,769.5	16,395.1
Total Whiting Catch (lbs.)	72,513.6	6,650.2
Total Shrimp Catch (lbs.)	1,960.3	64.7
Total Regulated Species Catch (lbs.)	1,689.5	5,432.2
Total Bycatch Regulated Species	2.1%	33.1%
Average Total Catch per Tow (lbs.)	604.3	683.7
Average Shrimp Catch per Tow (lbs.)	14.9	2.7
Average Regulated Species per Tow (lbs.)	12.8	226.3
Average Bycatch per Tow	3.6%	32.2%
Std Deviation Average Bycatch per Tow	8.8%	26.0%
Median Bycatch per Tow	1.6%	21.1%
Average Total CPUE per Tow (lbs./hr.)	296.2	1,748.4
Average Shrimp CPUE per Tow (lbs./hr.)	7.2	5.4
Average Reg. Species CPUE per Tow (lbs./hr.)	7.2	701.1

Bycatch in tows using the Nordmore grate was below 5% for regulated species, despite the minimal catches of shrimp. The comparative bycatch and CPUE data from Nordmore grate tows vs. control tows without the grate indicate that the Nordmore grate was effective at minimizing bycatch of regulated species present.

The low catch of shrimp was disappointing. It was the result of the small 1998 year class of male shrimp (smallest on record since 1983 inception of the summer ASMFC Shrimp Survey) and a delayed offshore migration of female shrimp. In a "normal" year for the May shrimp fishery, Maine Department of Marine Resources port sampling records indicate that shrimp catch per unit of effort would be closer to 200 lbs./hr.

		Grate					Control			
		132 tows	**fish/trip**	**fish/tow**	**fish/hr**		**24 tows**	**fish/trip**	**fish/tow**	**fish/hr**
		Total	**(12 trips)**	**(132 tows)**	**(278.5 hrs.)**		**Total**	**(9 trips)**	**(24 tows)**	**(11.8 hrs.)**
Numbers of Fish										
Regulated Species										
American Place		2260	188	17.1	8.1		799	89	33	68
Gray Sole		1004	84	7.6	3.6		173	19	7.2	14.7
Yellowtail Flounder		0	0	0	0		0	0	0	0
Winter Flounder		0	0	0	0		0	0	0	0
Windowpane Flounder		0	0	0	0		0	0	0	0
Cod		1	0.1	0.01	0.004		74	8	3.1	6.3
Haddock		5	0.4	0.04	0.02		286	32	11.9	24
Pollock		3	0.3	0.02	0.01		198	22	8.3	16.8
Redfish		1642	137	12.4	5.9		4352	484	181	369
White Hake		6	0.5	0.04	0.02		202	22	8.4	17.2
Other Species										
Silver Hake		565539	47128	4284	2031		41218	4580	1717	3493
Red Hake		9107	859	69	33		2124	236	89	180
Spiny Dogfish		203	16.9	1.5	0.7		772	86	32	65
Shrimp		----	----	----	----		----	----	----	----
Weight (lbs.)										
Regulated Species										
American Place		831.50	69.29	6.30	2.99		491.10	54.57	20.46	41.62
Gray Sole		296.50	24.71	2.25	1.06		73.70	8.19	3.07	6.25
Yellowtail Flounder		0	0	0	0		0	0	0	0
Winter Flounder		0	0	0	0		0	0	0	0
Windowpane Flounder		0.50	0.04	0.004	0.002		0	0	0	0
Cod		0.80	0.07	0.01	0.003		280.80	31.20	11.70	23.80
Haddock		2.00	0.17	0.02	0.01		550.70	61.19	22.95	46.67
Pollock		1.70	0.14	0.01	0.01		302.40	33.60	12.60	25.63
Redfish		548.90	45.74	4.16	1.97		3340.20	371.13	139.18	283.07
White Hake		7.70	0.64	0.06	0.03		393.40	43.71	16.39	33.34
*Other Species**										
Silver Hake		72513.60	6042.80	549.35	260.37		6650.20	738.91	277.09	563.58
Red Hake		2875.00	239.58	21.78	10.32		976.90	108.54	40.70	82.79
Spiny Dogfish		44.90	3.74	0.34	0.16		2338.70	259.86	97.45	198.19
Shrimp		1960.30	163.36	14.85	7.04		64.70	7.19	2.70	5.48

Table 107 - Experimental Shrimp Fishery, May, 2001. Catch by Species in Numbers and Weight for Experimental and Control Tows.

5.2.7.1.2 Northern Shrimp Exemption Area Option 1 - Status Quo

This option was not selected. Maintaining the status quo will not change or adversely affect groundfish stocks. The requirement to use a Nordmore grate has significantly reduced the groundfish bycatch in the northern shrimp fishery. For example, discards of American plaice ranged from 149 mt to 380 mt annually during the period 1983 through 1990, while in 1999 discards were only 26 mt (NEFSC 2001a). While some of this variation may be attributed to changes in effort in the shrimp fishery, the 1999 plaice discards from the shrimp fishery were estimated to be less than 5% by weight of the plaice discards that resulted from the large mesh otter trawl fishery. In terms of number of fish, however, the bycatch of plaice in the shrimp fishery was about 20 percent of the discards in the large mesh fishery. In 1996 the discards of plaice in the shrimp fishery were higher (by number) than in the large mesh trawl fishery, and in 1997 they were only slightly lower.

5.2.7.1.3 Northern Shrimp Fishery Exemption Area Option 2 – Eliminate Area Restrictions for the Northern Shrimp Fishery

The impacts of eliminating the area restriction for the Northern Shrimp Fishery cannot be estimated with certainty but should be minimal. The experimental fishery suggests that the total weight of regulated groundfish bycatch in this fishery will be minimal because of the use of the Nordmore grate. This experiment, however, took place in only one small area and during a brief time period. While it is not likely that fishing in another area or time will result in catching larger fish, it is possible that in different seasons or areas there may be a higher rate of bycatch of juvenile groundfish that the grate does not exclude. There have been years when the plaice bycatch in the shrimp fishery accounted for a large percentage of total bycatch. The catch of silver hake (whiting) observed in the experiment is another cause for concern from the standpoint of M-S Act requirements to minimize bycatch and bycatch mortality. This is not a concern from the standpoint of whiting mortality. The northern stock of whiting was above its threshold and target levels in 2001. Thus, it was not overfished and was considered rebuilt. In 2001, biomass of northern whiting was relatively high (176% of the biomass target value). Relative exploitation indices for whiting in the northern stock indicate that exploitation levels were low. Based on surplus production analyses presented in SAW 32, the MSY of the northern stock of whiting may be up to 45,000 mt, with an 80% confidence interval of roughly 39,000-52,000 mt (2001 SAFE Report). The 2002 SAFE Report indicates that landings of whiting from the northern stock averaged about 3,300 mt from 1999-2001. Arguably, economic considerations in the shrimp fishery will deter vessels from continuing to fish for shrimp if whiting bycatch is high – it is difficult to separate the whiting and shrimp and the mix of whiting and shrimp reduces the condition and value of the shrimp that are caught. The low value, limited markets available, and low trip limit for whiting make it unlikely that fishermen will intentionally fish in areas where the whiting bycatch is high. If bycatch of whiting is a problem, it could be readily addressed by adjusting the amount of whiting that shrimp vessels are allowed to land.

Impacts of this exemption on the shrimp fishery can be controlled through the ASMFC Interjurisdictional Fishery Management Plan for shrimp.

5.2.7.2 Tuna Purse Seine Vessel Access to Groundfish Closed Areas

The Council considered three primary options for tuna purse seine vessel access to groundfish closed areas. These are described in section 3.8.2 and 4.1.7.2. A thorough description of the tuna fishery, including the purse seine fishery, is provided in the Atlantic Highly Migratory Species FMP (NMFS 1999). Additional information specific to the tuna purse seine fishery in the vicinity of groundfish closed areas is contained in an environmental assessment prepared for an experimental tuna purse seine fishery in Closed Area 1 (NMFS 2001b). Prior to discussing the biological impacts of each option on the multispecies fishery, a short summary of the fishery and available information on bycatch is provided.

Tuna purse seine vessels use large nets (500 fathoms long and over 50 fathoms deep) to encircle schools of tuna. Due to the manner in which the net is deployed, the bottom of the net never extends to its full depth. One captain stated that his 45 fathom net will not contact the bottom in 31 fathoms of water.

Contact with the bottom can damage the net severely, resulting in expensive repairs and lost fishing time during a short season (NMFS 2001b).

The tuna purse seine fishery is managed through an individual transferable vessel quota system established in 1982. Five vessels are given an equal share of an annual bluefin tuna quota that is 18.6 percent of the U.S. bluefin tuna landings quota. Each vessel must stop fishing when it catches its quota, and cannot fish for other species of tuna after that since there is the possibility of catching additional bluefin. Under current regulations, fishing begins on August 15 of each year. According to the Atlantic Highly Migratory Species FMP (NMFS 1999), each vessel typically catches its quota within a matter of weeks, fishing entirely in mid-Atlantic and New England coastal waters (see Table 108). Testimony at NEFMC Groundfish Oversight Committee meetings said that the total number of tuna sets in a year is frequently only 50 sets for all five vessels, and is almost always less than 100 sets (Ruais, pers. comm.). Typically, the fishery is over by mid-October either because the vessels catch their quota or the fish migrate out of the area. Purse seine vessels have found large concentrations of tuna in the vicinity of CA I, and they have traditionally fished near this area (NMFS 2001b).

Year	Quota (mt)	Amount Landed (mt)	Last Landing Date
1996	251	245	October 19
1997	250	250	September 29
1998	250	248	October 8
1999	260	247	October 18
2000	271	275	October 3

Table 108 – Quota, landings, and last landing date for the tuna purse seine fishery, 1996 – 2000 (round weight). Season opens August 15. (NMFS, unpublished data)

Because this fishery is managed by a strict quota, the options under consideration by the Council should not have any additional biological impacts on the target tuna species. In recent years the fishery generally harvests, but does not exceed, its entire quota. None of the proposed options will change the amount of tuna landed by this fishery. With respect to groundfish management, however, allowing tuna purse seine vessels into groundfish closed areas could result in groundfish bycatch.

There is a limited amount of sea sampling and observer data on this fishery that documents the catch of non-target species. In 1996, observers on four vessels observed a total of 39 tuna purse seine sets on 42 trips (some trips had no sets). The trips occurred on Stellwagen Bank, northern part of Cape Cod Bay, and west of Closed Area I. The groundfish bycatch species caught on nineteen of those sets is summarized in Table 109. In addition to finfish bycatch, 20 of the 39 purse seine sets had bycatch of benthic habitat such as sponges, rockweed, empty shells, kelp, and rocks. This indicates the purse seines had contact with, partially removed, and caused disturbances to bottom habitats (Kurkul 2000). Section 5.2.8.5 analyzes the impacts of the management options on habitat.

In the fall of 2000, an experimental fishery was authorized that allowed tuna purse seine fishing in Closed Area I. After considering the observations from the trips observed in 1996, and after conducting an Essential Fish Habitat Consultation (Kurkul 2000), the experimental fishery was authorized subject to the following restrictions:

- An observer was required when fishing in Closed Area I.

- Vessels were required to fish in locations where the depth of water was greater than 30 fathoms or greater than the depth of the net. Alternatively, the net used had to be modified so that its depth was less than the depth of the water.
- Vessels could not fish in Closed Area II or the NLCA.
- All catch or incidental catch had to be available for identification, weighing, and measuring.
- Vessels were prohibited from retaining or landing multispecies finfish.
- Nets have to be set to avoid fixed gear wherever possible.

Some of the sets from this fishery were also observed. While because of the small number of sets the data would normally be confidential, vessel operators from two vessels provided the data to the Council for consideration. Five sets were observed, with no groundfish bycatch and only small amounts of other species. A summary of the observed sets is provided in Table 110. One difference between the observations in 2000 from those in 1996 is that all of the recent sets took place in water depths deeper than the net depth, while in 1996 many of the sets were in water depths shallower than the net depth. The location of all observed sets for 1996 and 2000 is shown in Figure 129. None of the sets observed in Closed Area I resulted in groundfish bycatch.

5.2.7.2.1 Option 1 – No Action

This option was not selected. Under this option, tuna purse seine vessels would not be allowed access to Closed Areas I, II, or the NLCA. This option provides the greatest protection to groundfish located in those areas. There is no possibility that additional groundfish mortality will result from tuna purse seine operations in the closed areas. While there is the possibility of groundfish bycatch in the other closed areas, the amount is insignificant based on the observed purse seine sets.

Allowing an exempted fishery into a closed area could increase groundfish mortality and weaken the effectiveness of a closure by complicating enforcement efforts. This option does not increase the number of fishing activities allowed in these closed areas. As a result, enforcement efforts are not complicated and there should not be any additional impacts on groundfish mortality.

5.2.7.2.2 Option 2 - Access With Restrictions

This option was not selected. Based on purse seine sets observed in 1996, there is the possibility of some groundfish and bycatch impacts from purse seine vessels operating without restrictions (habitat impacts are discussed in section 5.3.7.2). The limited number of sets observed in 2000, however, did not have any groundfish bycatch, suggesting that the restrictions applied to the experimental fishery can essentially eliminate the possibility of groundfish bycatch.

A review of Table 109 shows that most of the groundfish bycatch occurred when sets were made in less than 30 fathoms. Limiting purse seine operations to depths of more than 30 fathoms, then, can be expected to reduce significantly the possibility of groundfish bycatch in the closed areas. Coupled with the limited number of sets that are made in this fishery, and the likelihood that not all sets will be made in closed areas, the amount of groundfish bycatch in this option is likely to be insignificant, though marginally higher than that for the status quo. This option also changes the current access of tuna purse seine vessels to the areas of the seasonal closures in the Gulf of Maine, and the WGOM closed area. There may be some positive benefits to groundfish as a result, this restriction is not applied to the NLCA for several reasons. First, almost the entire area is less than 30 fathoms deep; it would be easier to simply prohibit seine operations from this area. Second, there is less reason for this restriction to protect habitat because of the sandy composition of most of this area, as opposed to the areas of hard bottom habitat within Closed Area I and Closed Area II.

Prohibiting purse seine operations in any HAPC will also benefit groundfish stocks if the HAPC is defined for their protection. The existing HAPC was designated in part to protect juvenile cod settlement areas. By preventing purse seine operations in this area, there is no possibility that this fishing activity will adversely affect juvenile cod in this area.

The tuna purse seine fishery does not begin until mid-August. Since most groundfish spawning activity occurs in the winter or spring, allowing purse seine operations to take place in the closed areas will have minimal impacts on spawning activity.

Finally, the ability of the Regional Administrator to place additional restrictions on the fishery, or prohibit a vessel or vessels from the closed areas, provides an additional incentive for vessel operators to avoid all groundfish bycatch.

5.2.7.2.3 Option 3 – Access Without Restrictions

This option is the proposed action. Under this option, purse seine vessels can operate in all groundfish closed areas, limited to a prohibition on possessing or catching groundfish and on having gear on board capable of catching groundfish. These limitations are routinely applied to fisheries that are allowed into closed areas.

Because tuna purse seine operations will be allowed without restriction in Closed Areas I, II, and the NLCA, there is the possibility of some increases in groundfish bycatch in those areas. Based on the sets observed in 1996, these impacts are likely to be small. The number of sets in the entire fishery is far less than 100 according to public testimony, and not all sets are likely to occur in the closed areas. This option may slightly increase groundfish bycatch in the closed areas, but the impacts are judged to be insignificant. Indeed, since purse seine sets outside the area can also occasionally catch groundfish, it is not clear that this option will actually increase groundfish bycatch; rather, it may just move the location.

One indirect effect on groundfish areas may result by allowing an additional group of vessels into the areas. Enforcement agencies have repeatedly noted that each exception to a closed area reduces their ability to effectively patrol the area. As a result, it may become easier for other vessels to illegally fish in the closed areas and groundfish mortality could increase. This particular exception, however, only applies to five vessels. Purse seine operations are significantly different than groundfish fishing activities. The small number of vessels (five), type of operations, and limited season (generally August through mid-October) should reduce the impacts of this closure on enforcement operations.

The tuna purse seine fishery does not begin until mid-August. Since most groundfish spawning activity occurs in the winter or spring, allowing purse seine operations to take place in the closed areas will have no impact on spawning activity.

Approximate Location	Bottom Depth (in fm)	Net Depth (in fm)	Min. Mesh Size (inch)	Bycatch (in lbs.)
41°50' / 70°20' Cape Cod Bay	12	30	4.0	Skate (Unclassified) (10.0) Crab (2.0) Sponge (20.0) Lobster (1.0)
42°28' / 70°28' Stellwagen Bank	30	48	4.3	Jonah Crab (1.0) Rockweed (10.0)
42°26' / 70°23' Stellwagen Bank	33	40	3.0	Monkfish (3.0) Whiting (0.5)
41°48' / 70°19' Cape Cod Bay	not listed	48	4.3	Monkfish (4.0) Rockweed (5.0)
41°06' / 69°15' Great South Channel	28	40	3.0	Sea Robin (1.0)
42°08' / 70°17' N. Cape Cod Bay	29	40	3.0	Yellowtail Fld (1.0) Goosefish Fld (4.0) Rock Crab (5.0) Skate (Unclassified) (2.0)
42°10' / 70°17' N. Cape Cod Bay	not listed	48	4.3	Rockweed (5.0) Jonah Crab (0.5)
42°08' / 70°20' N. Cape Cod Bay	not listed	48	4.3	Rockweed (5.0)
42°27' / 70°24' Stellwagen Bank	not listed	48	4.0	Monkfish (4.0) Rockweed (10.0) Jellyfish (5.0)
42°13' / 70°16' Stellwagen Bank	14	40	3.0	Thorny Skate (500) Spiny Dogfish (500)
41°10' / 69°20' Great South Channel	not listed	48	4.3	Rockweed (100)
41°05' / 69°15' Great South Channel	35	40	3.0	Skate (Unclassified) 20.0) Monkfish (8.0) Bluefish (45.0) Spiny Dogfish (10.0)
42°14' / 70°19' Stellwagen Bank	20	40	3.0	Monkfish (4.0) Skate (Unclassified) (6.0) Empty Shells (2.0) Spiny Dogfish (2.0)

Table 109 – Summary of purse seine sets observed in 1996 that retained bottom species or debris. Vessel names and dates, not provided to protect confidentiality.
Source: NMFS 2001b

Approximate Location	Bottom Depth (in fm)	Net Depth (in fm)	Min. Mesh Size (inch)	Bycatch (in lbs.)
42°20' / 70°10' Stellwagen Bank	not listed	48	4.3	Cod (60.0) Monkfish (90.0) Winter Fld (25.0) Pollock (250.0) Yellowtail Fld (10.0) Wolfish (5.0) Scallops (1.0) Sea Robin (80.0) Longhorn Sculpin (40.0) Skate (Unclassified) (307.0) Sponge (8.0) Starfish (1.0) Crab (1.0)
42°17' / 70°18' Stellwagen Bank	15	40	3.0	Skate (Unclassified) (5.0) Spiny Dogfish (250) Monkfish (2)
42°20' / 70°10' Stellwagen Bank	20	48-54	3.5	Spiny Dogfish (250) Leopard Skate (5) Striped Bass (30)
42°20' / 70°10' Stellwagen Bank	37	48-54	3.5	Dogfish (100)
42°05' / 70°20' N. Cape Cod Bay	35	48-54	3.5	Dogfish (50) Atlantic Herring (100)
41°03' / 69°18' Great South Channel	35	48	4.3	Brown Kelp (5.0)
42°20' / 70°23' Stellwagen Bank	18	48	4.3	Spiny Dogfish (370) Jonah Crab (6) Winter Skate (50) Yellowtail Flounder (10) Monkfish (7) Winter Flounder (5) Longhorn Sculpin (1) Rocks and Debris (750)

Table 109 (cont.)– Summary of purse seine sets observed in 1996 that retained bottom species or debris. Vessel names and dates, not provided to protect confidentiality.
Source: NMFS 2001b

Location	Bottom Depth/Net Depth	Mesh Size	Bycatch #lbs.
41°15' /69°02'	86fm/48fm	4" top/8" bottom	none
41°11 /69°07'	55fm/48fm	same as above	jellyfish (10 lbs.)
41°17' /68°59'	81fm/48fm	same as above	2 blueshark returned
41°16.8' /68°56'	66fm/30fm	3"	2 blueshark released alive
41°18.6' /69°01'	83.7fm/30fm	3"	none

Table 110 - Summary of purse seine sets observed in 2000. Vessel names, dates, and locations not provided to protect confidentiality.
Source: NMFS 2001b

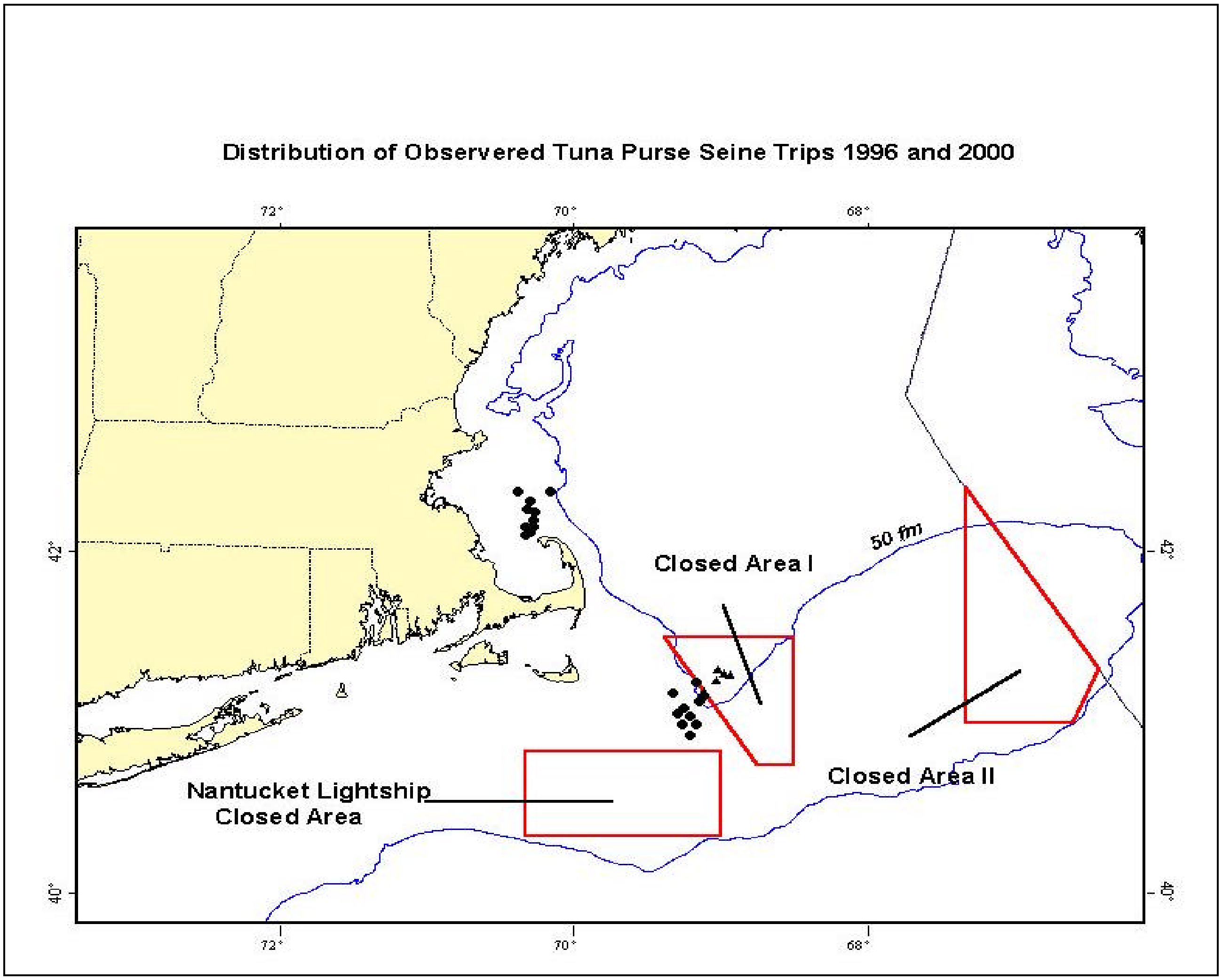


Figure 129– Distribution of all observed tuna purse seine sets, 1996 and 2000. (Resolution and scale of chart hides multiple sets in similar positions).
Source: NMFS 2001b

5.2.7.3 SNE General Category Scallop Exemption Program

The proposed action adopts this scallop exemption program. The designation of a SNE General Category Scallop Exemption Program should not have significant impacts on groundfish mortality. An examination of observed sea sampling dredge trips conducted in statistical areas 537, 538, 539, and 613 for he period 1994 through 2000 found that scallop trips in this area had little regulated species bycatch. 36 trips in all were observed, including dredges both smaller and larger than 15 feet. For all observed trips, the regulated species mean catch was 136 pounds, or less than 1 percent of the total catch by weight. For dredges less than 15 feet, the mean regulated species catch was only 48 pounds, again less than 1 percent of the total catch. The regulated species catch on any of the observed trips never exceeded more than 1 percent of the catch by weight. It should be noted that many of these trips took place before the requirement to use an 8 inch twine top was adopted, a measure that has been demonstrated to reduce groundfish bycatch in a scallop dredge even further. This requirement is included in this proposed alternative. Additional evidence is available in the 2001 scallop SAFE report that supports the lack of impacts on groundfish mortality that will result from this program. In the scallop fishing year from March 1999 through February 2000, 69 General Category Permit scallop vessels used dredges, landing a total of 61,339 pounds of scallops. Total reported regulated groundfish landings for these vessels was about 40 pounds, far less than 1 percent.

This program may have impacts on scallop mortality and management that are discussed in a qualitative way in the section on impacts on other fisheries.

5.2.8 Impact of Alternatives on Bycatch

National Standard 9 of the M-S Act requires that conservation and management measures shall, to the extent practicable, minimize bycatch and to the extent bycatch cannot be avoided, minimize the mortality of bycatch. Bycatch is defined as fish harvested in a fishery but which are not sold or kept for personal use. The NSGs provide further advice on bycatch, noting that it includes economic and regulatory discards, and fishing mortality due to an encounter with fishing gear that does not result in capture of fish (unobserved fishing mortality). It is important to note neither the M-S Act nor the NSGs place restrictions on how bycatch can be reduced. For example, simply allowing or requiring the retention of all species caught would be an acceptable way to minimize bycatch if it can be done without violating other biological objectives: changing measures so that more of the bycatch can be retained is just as valid an approach under the M-S Act as changing measures to reduce the catch of some species.

The NSGs place the emphasis on minimizing bycatch – that is, avoiding the catch of bycatch species. Guidance is also provided for assessing whether management measures minimize bycatch to the extent practicable. Councils must:

(1) Promote development of a database on bycatch and bycatch mortality in the fishery to the extent practicable;
(2) For each measure, assess the effects on the amount and type of bycatch and bycatch mortality in the fishery (qualitative discussions are allowed when quantitative estimates are not available);
(3) Select measures to the extent practicable that will minimize bycatch and bycatch mortality;
(4) Monitor selected measures for impacts on bycatch;
(5) Consider other applicable law (MMPA, ESA, etc.).

The NSGs provide guidance on determining if measures minimize bycatch "to the extent practicable." The NSGs suggest this practicability determination should be based on such factors as the ecological changes that result from bycatch of a species, effects on marine mammals and birds, changes in fishing, processing, and marketing costs, changes in research and other administrative costs, and changes in the social and cultural values of the fishing activities. All of these criteria for this making the practicability determination assume the ability to know precisely how particular measures will influence bycatch and fishermen's behavior and what the impacts of those changes will be. This information is not available for the multispecies fishery. As discussed in section 9.4.2.8, most bycatch information currently collected and reported by the NMFS is based on broad gear categories (large mesh otter trawl, gillnet, longline, etc.) without regard to specific fishery. With the possible exception of trawl mesh selectivity studies and a few studies on specific gear requirements (such as the raised footrope trawl or haddock separator trawl), there is little information with which to estimate the impacts of a specific management measures on bycatch. For example, there is no information available to estimate how a specific area closure might affect bycatch, and what the resulting impacts of that change have on marketing or harvesting costs. Because of these data limitations, the following analysis focuses on identifying whether proposed measures will increase or decrease bycatch as compared to the no action alternative.

The total mortality resulting from bycatch can be reduced in at least three broad ways. First, the **rate** of bycatch can be reduced. As an example, the discard rates of sub-legal fish can be reduced by increasing mesh size, since larger mesh will allow more sub-legal fish (that must be discarded to comply with the minimum size regulations) to escape. Bycatch could also be reduced by allowing retention of smaller fish, though this may have other adverse impacts. Regulatory discards caused by trip limits can be reduced by increasing trip limits or by requiring use of gear that does not catch as much of a particular species. Gear that does not catch as much of a particular species could be required - for example, the haddock separator trawl reduces the catch of flatfish and skates. Second, reducing fishing effort can reduce **total bycatch** (even if the rate remains the same or increases). If, for example, each longline set catches a percentage of juvenile fish that must be discarded, reducing the number of sets would reduce the total catch of juvenile fish even if the percentage caught per set remains the same. Neither the M-S Act nor the NSGs assign a preference to either of these approaches. Finally, the **mortality of species caught** as bycatch may be reduced through changes in fishing techniques. The M-S Act, however, assigns this a lower priority than reducing bycatch.

Current information available on bycatch in the multispecies fishery is summarized in section 9.4.2.8. This section assesses the impacts of the proposed management measures on bycatch. There is little information available on how to estimate the impacts of specific measures on bycatch and bycatch mortality, so much of the discussion is qualitative. All proposed measures are compared to the measures in place during fishing year 2001 and are compared relative to each other. This section focuses on bycatch of fish and shellfish; impacts of the measures on protected species (including the bycatch of protected species) is in section 5.2.9.

5.2.8.1 Proposed Rebuilding Programs

The Council considered three possible rebuilding strategies: a constant fishing mortality rate, and a phased reduction fishing mortality rate, and an adaptive management strategy (see section 3.2). In concept, measures can be designed that will minimize bycatch and bycatch mortality to the extent practicable for any of the proposed rebuilding strategies. If fishing mortality has to be reduced while stocks (and presumably catch rates) are increasing, designing and choosing appropriate measures may be more difficult. The selection of a rebuilding strategy may thus have an indirect effect on attempt to minimize bycatch to the extent practicable.

Each of the rebuilding strategies will require significant reductions in catch in the initial years of the program. The constant mortality rate strategy requires the largest reduction which means reducing bycatch under this option may initially be the most difficult. The phased reduction approach reduces mortality to the lowest levels in the middle of the rebuilding program, but ameliorates this situation somewhat by allowing mortality to increase slightly in the later years of the rebuilding program. It may also be easier under the phased reduction approach to design measures for the early years of the program, as mortality does not have to be reduced as much as under the constant fishing mortality rate approach. The adaptive strategy keeps mortality at the highest levels through 2008, which may make it easier to design measures to minimize bycatch in the early years of the program. If mortality must decline significantly in 2009, the it will be more difficult to reduce bycatch with larger stock sizes. If appropriate measures can be designed and implemented with the adoption of the amendment, the constant fishing mortality approach may require few changes to address bycatch over the rebuilding period.

In summary, designing management measures to minimize bycatch is likely to be most difficult in the middle years of the phased reduction strategy. The phased reduction approach ameliorates some of these problems by allowing an increase in mortality in the later years as stocks increase. Minimizing bycatch under the constant fishing mortality strategy may prove most difficult in the early years of the rebuilding program. These impacts should be considered in the context of the benefits that are likely to accrue under the different strategies in order to determine practicability.

The proposed action combines the adaptive and phased reduction strategies for overfished stocks. For most stocks in the adaptive strategy, fishing mortality rates do not need a large decline in 2009. For those stocks in the phased strategy, the stock that has the lowest mortality in the next decade is CC/GOM yellowtail flounder. This suggests that bycatch prevention measures may have to be designed for this stock in the future.

5.2.8.2 Fishery Program Administration

Most of these measures will not directly impact bycatch or bycatch mortality. Some of the measures, however, reflect Council efforts to promote improved understanding of bycatch and bycatch mortality or monitor the impacts of management measures on bycatch. Some of the measures may also have indirect effects on bycatch. The following sections only discuss those measures that are believed to have an impact on bycatch or bycatch mortality.

5.2.8.2.1 Fishing Year

The proposed action does not change the fishing year. Any change to the fishing year should not have a direct effect on bycatch or bycatch mortality. It is possible that fishing years that begin when fish are aggregated may have indirect effects on bycatch. DAS allocations for vessels are available at the beginning of the year, and it is possible that vessels may choose to fish a large number of their DAS when fish are aggregated. Based on the assumption that bycatch is highest when fish are aggregated, a fishing year that gives vessels a new DAS allocation at such a time may result in higher levels of discards. Under Amendment 7, the fishing year begins in May, when many groundfish are aggregated just prior to or after spawning. The alternatives that change the fishing year to January, July, or October may indirectly result in reducing bycatch, while keeping the start of the year in May will have no change from the current situation.

5.2.8.2.2 Modified Periodic Adjustment Process

Adopting these changes, as proposed, will not influence bycatch. The periodic adjustment process does enable the Council an opportunity to monitor and respond to bycatch issues. While at first an annual adjustment process may appear to provide more opportunities in this regard, none of the alternatives proposed preclude the Council from taking action to address a bycatch problem at other times. In addition, an annual process does not necessarily mean better information will be available, as the collection and analysis bycatch information is time consuming. In summary, there should not be any difference among the alternatives for the adjustment process.

5.2.8.2.3 United States/Canada Resource Sharing Understanding

The proposed action adopts a resource sharing understanding for eastern GB cod, haddock, and yellowtail flounder. While on the surface the agreement would not be expected to have any impacts on bycatch, measures adopted to implement the agreement may. Fishing activity in statistical areas 561 and 562 (5zjm) will be subject to a hard TAC for cod, haddock, and yellowtail flounder. Because of the low cod TAC and the need to minimize catches of cod while harvesting the other two species, vessels are required to use gear that is designed to minimize the catch of cod. The use of a haddock separator trawl has been demonstrated to reduce catches of cod by up to sixty percent while fishing for haddock (see section 4.1.5.3).

5.2.8.2.4 Administration of Certified Bycatch/Exempted Fisheries

These alternatives should not have any direct impacts on bycatch or bycatch mortality. All may have indirect effects, however.

Standards for Certification
This change is part of the proposed action. The proposed measure provides additional flexibility to the Council to minimize bycatch and bycatch mortality. Current standards for certification of exempted fisheries do not allow retention of regulated groundfish and some other species, generating regulatory discards. This alternative provides the Council the flexibility to allow retention of other species, converting discards into landings. This alternative also increases the Council's commitment to monitor these fisheries as groundfish stocks increase.

Review of Exempted Gears and Certified Bycatch/Exempted Fisheries
The Council did not adopt this alternative. This alternative would have established a schedule for reviewing exempted gears and exempted fisheries. This expands on the Council's commitment to monitor these fisheries for bycatch, to alter the restrictions on these fisheries as necessary to reduce bycatch, and to promote the development of data on bycatch and bycatch mortality in these fisheries.

5.2.8.2.5 Special Access Programs

The provisions in this alternative are designed to ensure approved programs do not have an adverse impact on bycatch or bycatch mortality. As such, it is an additional commitment by the Council to monitor and assess bycatch in the groundfish fishery. As a general rule, a special access program could increase the opportunity for bycatch to occur because it allows fishing activity that is otherwise not allowed under the management program. Bycatch mitigation/reduction measures should be a component of any special access program. This could be through the adoption of specific measures to reduce/mitigate bycatch, or by demonstrating the special access program does not increase bycatch.

There are also specific special access programs contained in this alternative. The likely bycatch impacts of each proposed SAP are described below.

Georges Bank Yellowtail Flounder Special Access Program
Allowing access to CAII may increase bycatch for many of the same reasons as moving the southern boundary of CAII. The increase must be considered in light of the strict limits on number of trips and the overall reduction in DAS.

This program will allow otter trawling in a small area of Closed Area II. There is no information in the bycatch of other species that will result from otter trawls, though an experiment is being conducted in the area (fall 2002). The primary bycatch from three observed otter trawl trips just outside Closed Area II suggests the primary bycatch is likely to be skates of various species (Table 111). It is not likely that bycatch rates will be the same as in these observed trips. In addition, it is not clear if any bycatch from within the closed area will be in addition to bycatch outside the area, or will merely reflect an effort shift without any increase in bycatch (unless the rate increases inside the closed area). From observed tows during the sea scallop exemption program in 2000, however, it is clear that little, winter, and barndoor skates will be encountered.

As indicated from the observer data, otter trawls can also be expected to take sea scallops. Current regulations limit trawl vessels to 400 lbs. of scallop meat per trip. Based on the size and density of sea scallops in the proposed access area, vessels using flounder nets are likely to encounter considerable scallop bycatch. Flounder nets can be easily modified to catch scallops if vessels wish to target them rather than yellowtail flounder. However, the low trip limit may act as a deterrent. Under certain conditions (high temperatures during summer months and long sorting times on deck), groundfish vessels may incur significant scallop mortality.

	Weight (lbs)		
Species	**Discarded**	**Kept**	**Grand Total**
Monkfish	23	6993	7016
Cod		186	186
Winter	20	9914	9934
Summer	585.5	4	589.5
Witch	20		20
Yellowtail	1892.5	70981	72873.5
Plaice	2	13	15
Sand-Dab	1650	3	1653
Fourspot	462		462
Sculpins	958		958
Sea Raven	1136		1136
Skate, Little	94725		94725
Skate, Winter	20170	7447	27617
368 – Skate, Barndoor	660		660
800 – Sea Scallop	53	1002	1055

Table 111– Primary bycatch from three otter trawl trips near Closed Area II

High concentrations of scallops were observed in 2000 and 2001 in the east-central portion of the proposed access area. In 2000, the scallops were less than 80 mm and generally would not be retained by large mesh trawls. The scallops are projected to grow to around 100 mm by 2002, a size typically targeted by scallop trawl vessels. It is likely that these scallops will be retained in trawl nets targeting yellowtail flounder. Based on yellowtail flounder bycatch distribution and yellowtail flounder catches during scallop surveys in 1998 and 1999, yellowtail flounder abundance appears to be as high or higher in the five blocks to the north and east of the proposed access area. Allowing yellowtail fishing in this area may increase flounder catch rates and reduce the scallop bycatch. There is a risk , however, of increased cod and winter flounder bycatch in these blocks based on the observed tows in the 2000 sea scallop exemption program (Figure 132 and Figure 133).

In summary, the proposed access program is likely to result in the catch and discard of little, winter, and barndoor skates. Whether the catch rates will be higher than outside the closed area is unknown. Scallop bycatch is also likely to increase, and given the density of scallops within the close area, will likely increase from the rates observed outside the closed area. A mandatory observer program (at some level of coverage) would facilitate collection of information on the catch rates of all species.

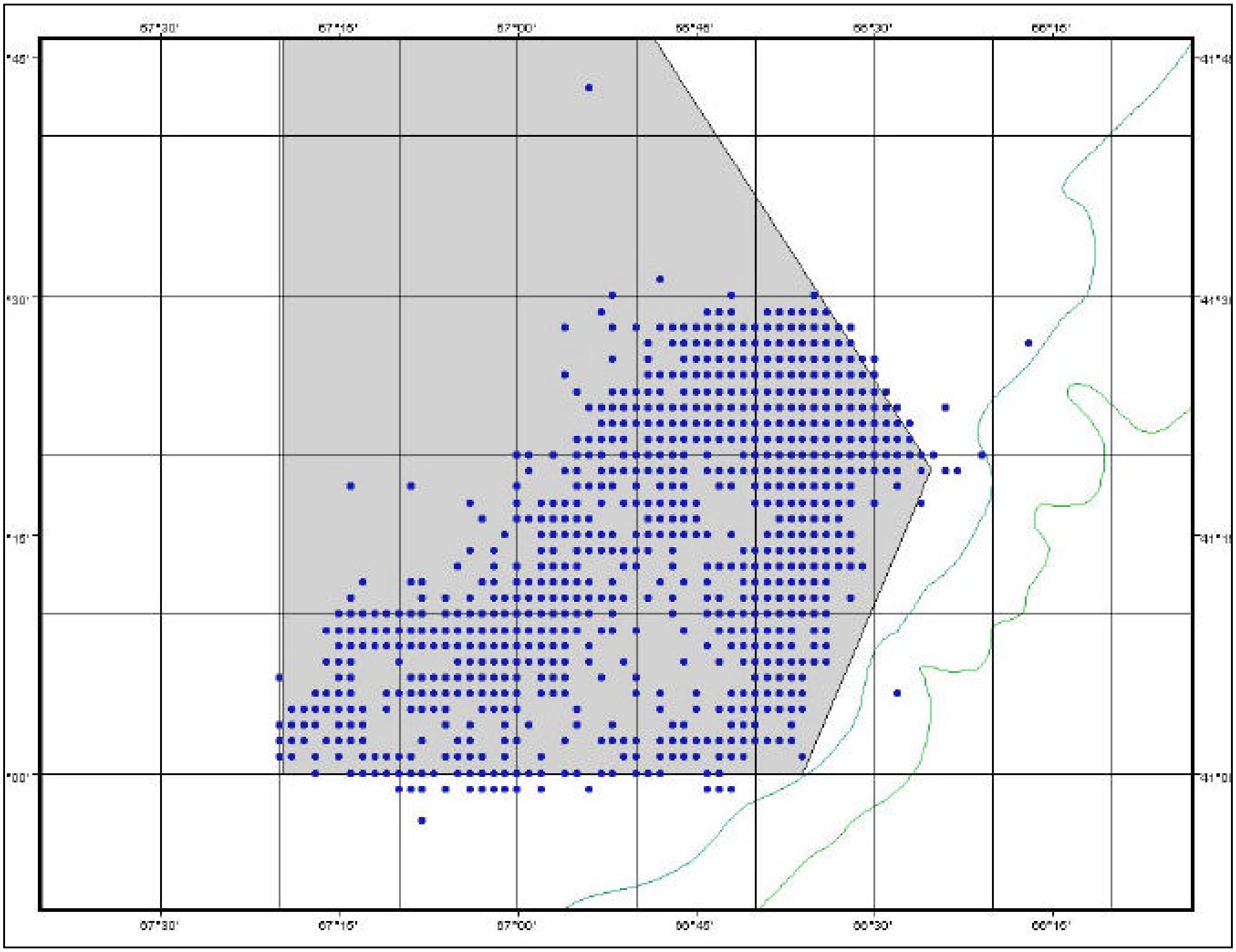


Figure 130 – Location of observed tows in Closed Area II, 2000 Sea Scallop Exemption program. Multiple tows at each location

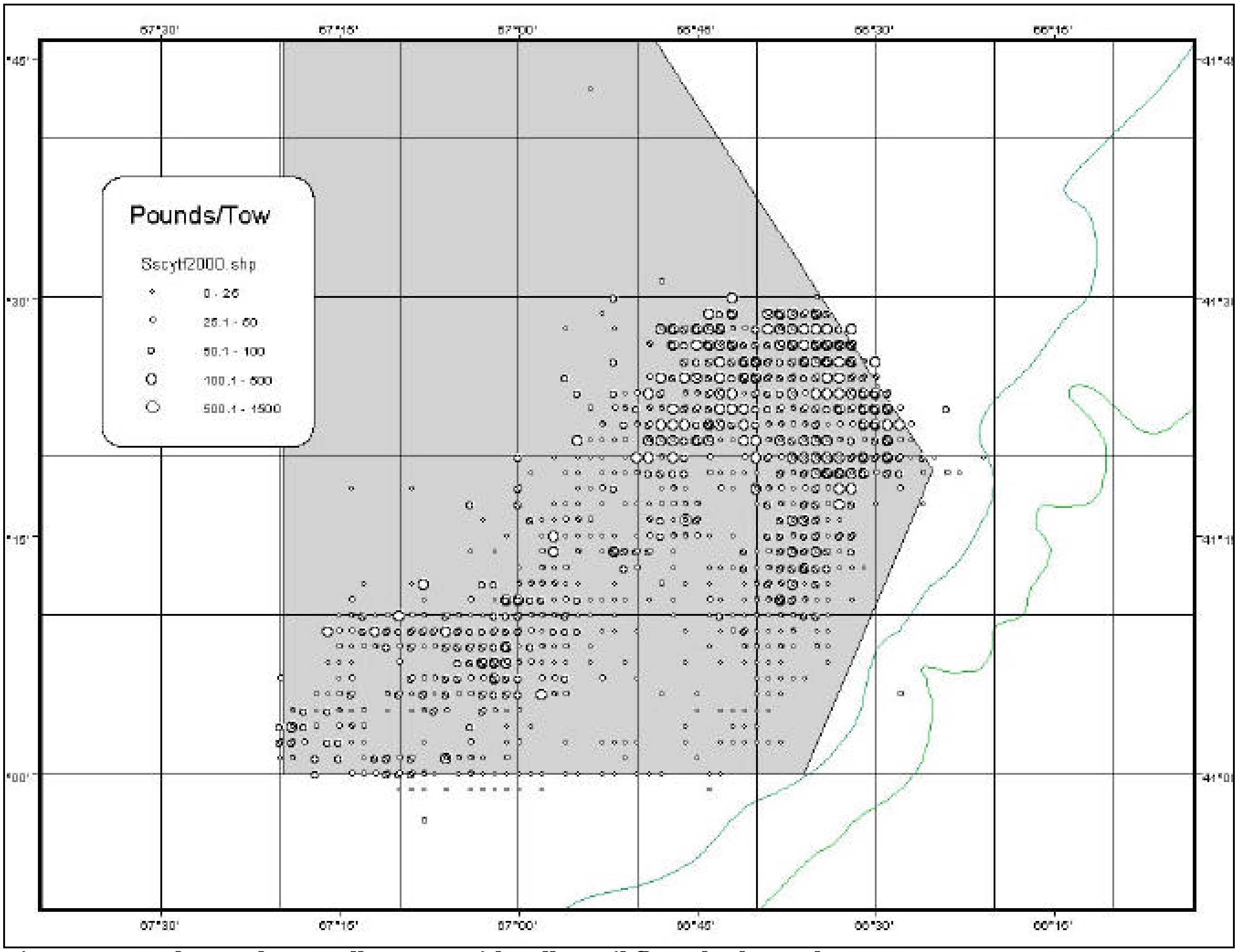


Figure 131 – Observed sea scallop tows with yellowtail flounder bycatch

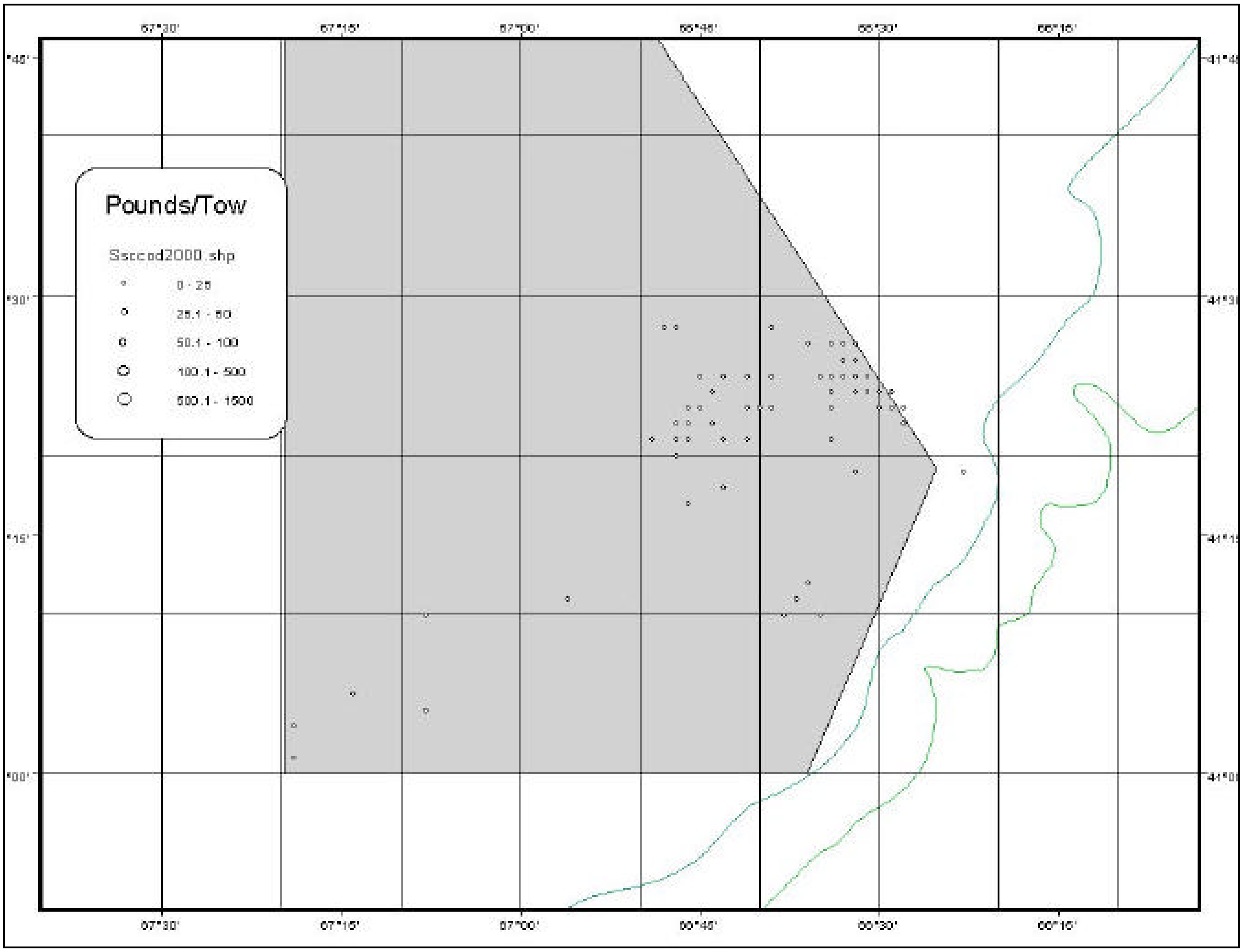


Figure 132 –Observed sea scallop tows with cod bycatch, 2000

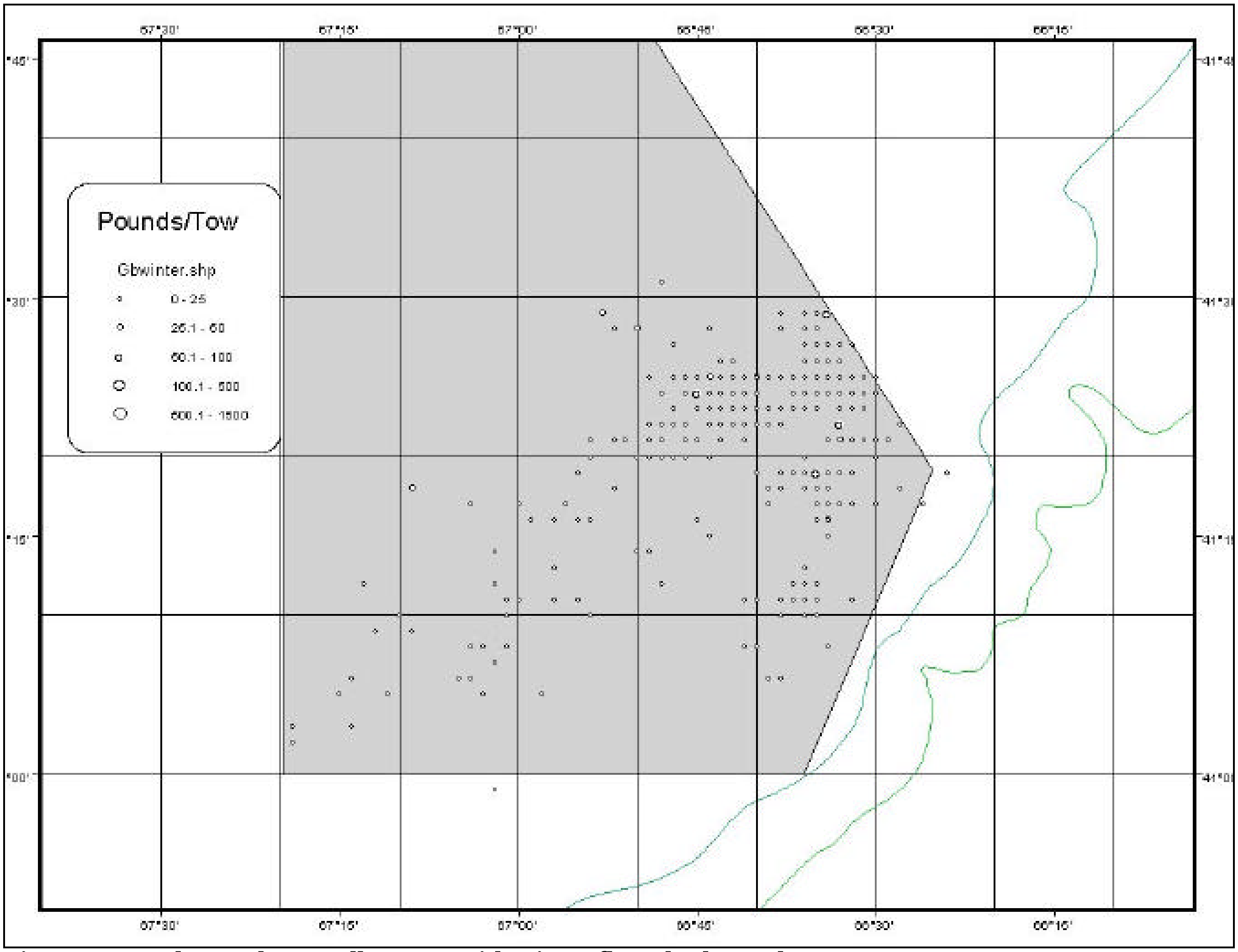


Figure 133 – Observed sea scallop tows with winter flounder bycatch

The analysis of the biological impacts of the yellowtail flounder Closed Area II Special Access program in section 5.2.4.6.1 describes expected yellowtail flounder catch based on the preliminary results of a an experiment conducted by the Manomet Center for Conservation Sciences. Information on bycatch was collected during this same experiment. While locations and densities of the various species encountered during this fishery changed slightly when aggregated by month, the yellowtail access fishery proposed here is intended to occur throughout the duration of the experimental fishery. Therefore, the following figures summarize observed catches for key species aggregated over the four-month duration of this fishery.

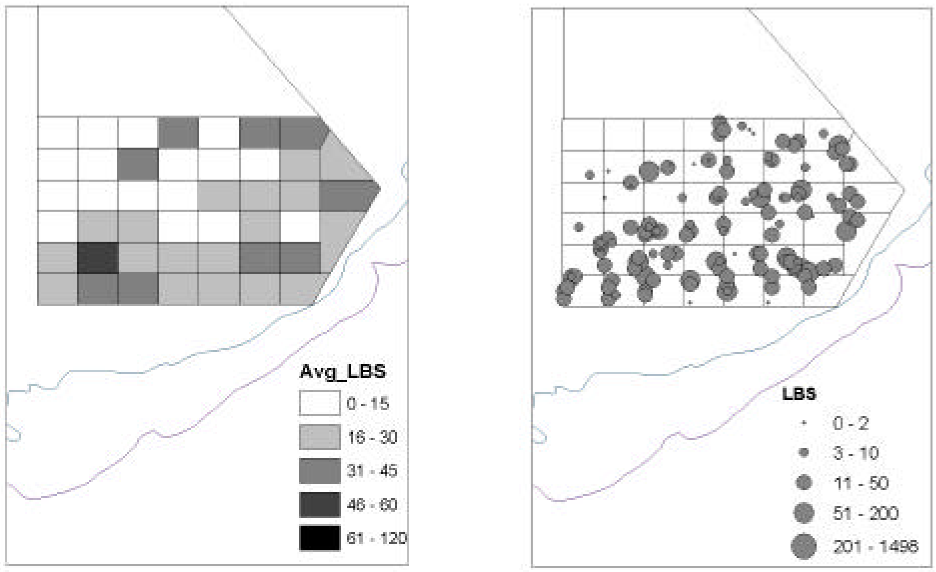


Figure 134 – Mean wt per tow per grid block, total wt per tow for Barndoor Skate.

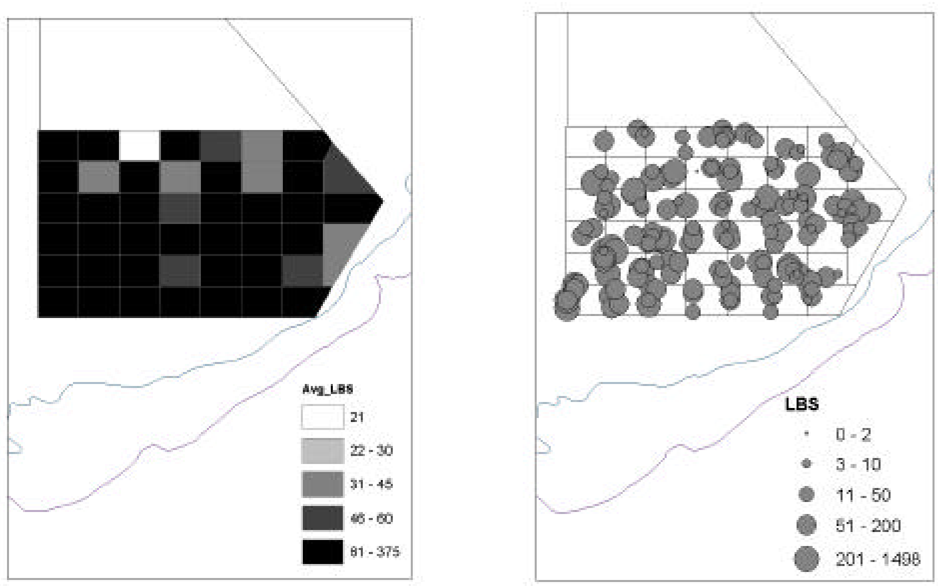


Figure 135 - Mean wt per tow per grid block, total wt per tow for Little Skate.

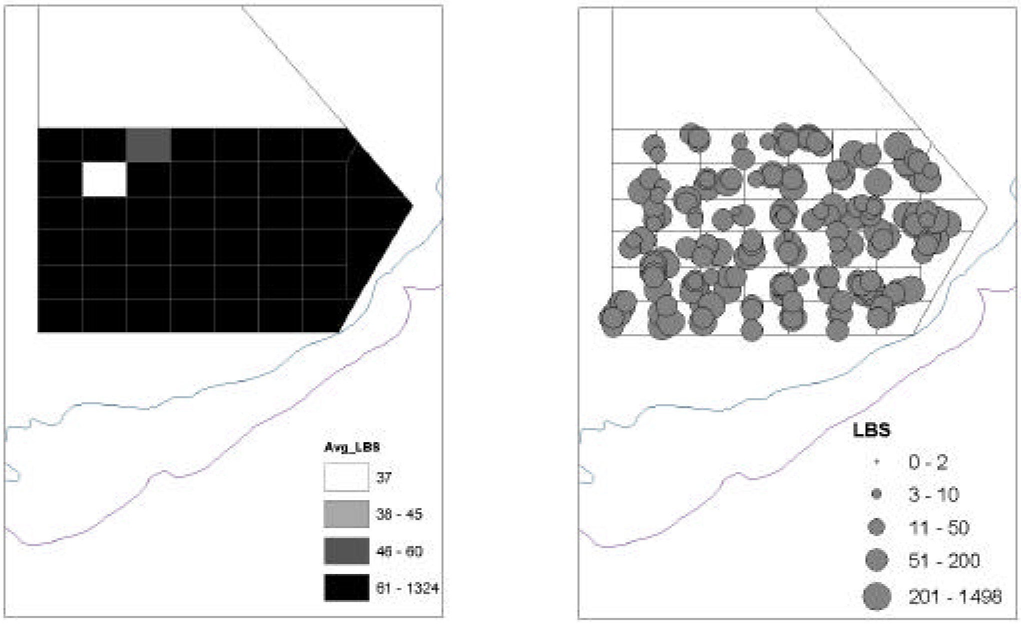


Figure 136 - Mean wt per tow per grid block, total wt per tow for Winter Skate.

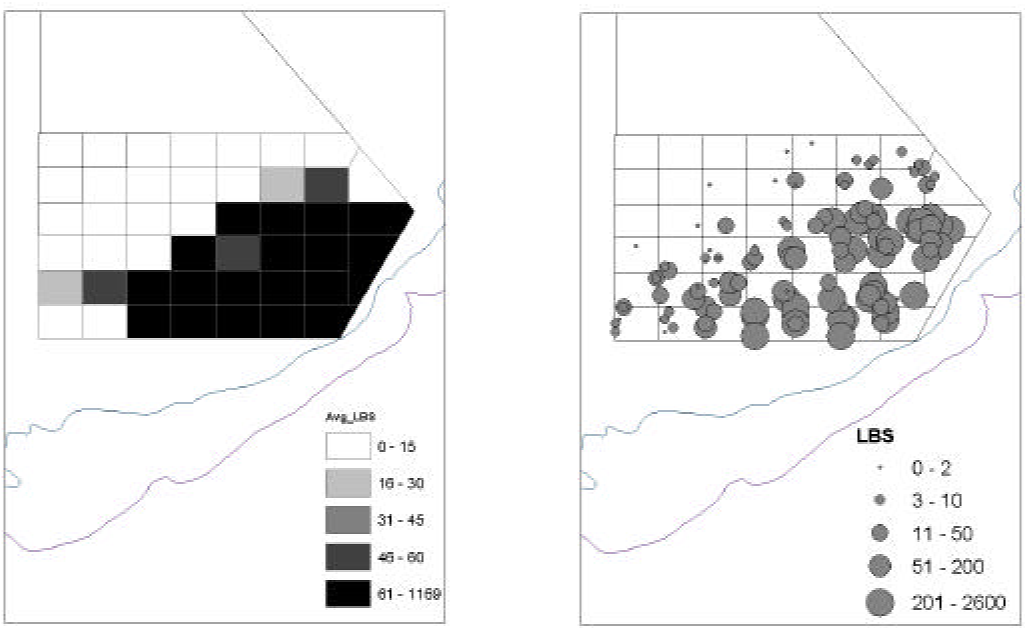


Figure 137 - Mean wt per tow per grid block, total wt per tow for Sea Scallops (wt in shell).

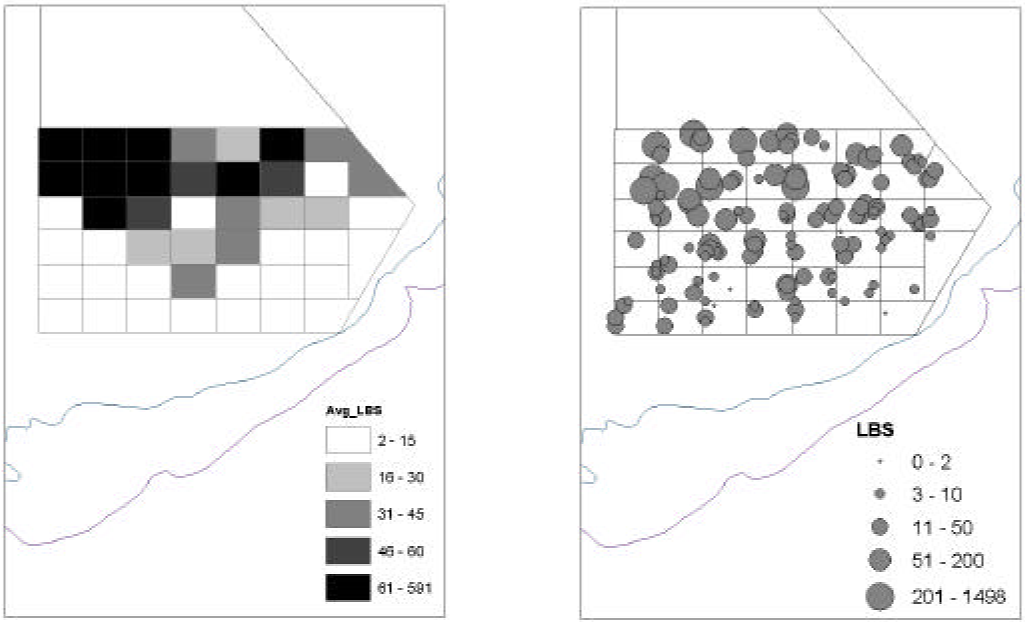


Figure 138 - Mean wt per tow per grid block, total wt per tow for Winter Flounder.

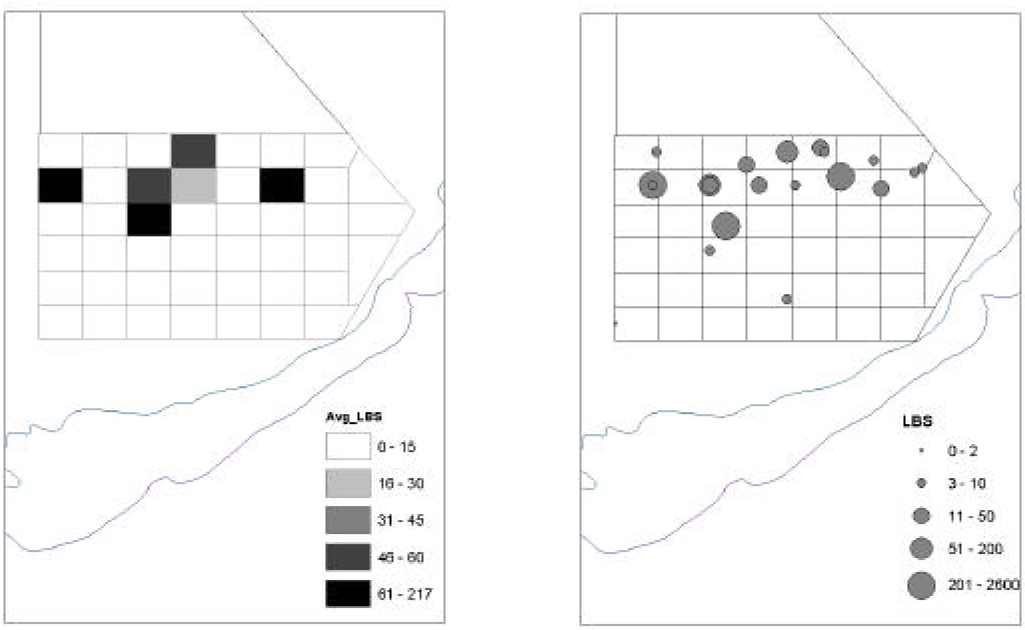


Figure 139 - Mean wt per tow per grid block, total wt per tow for Haddock.

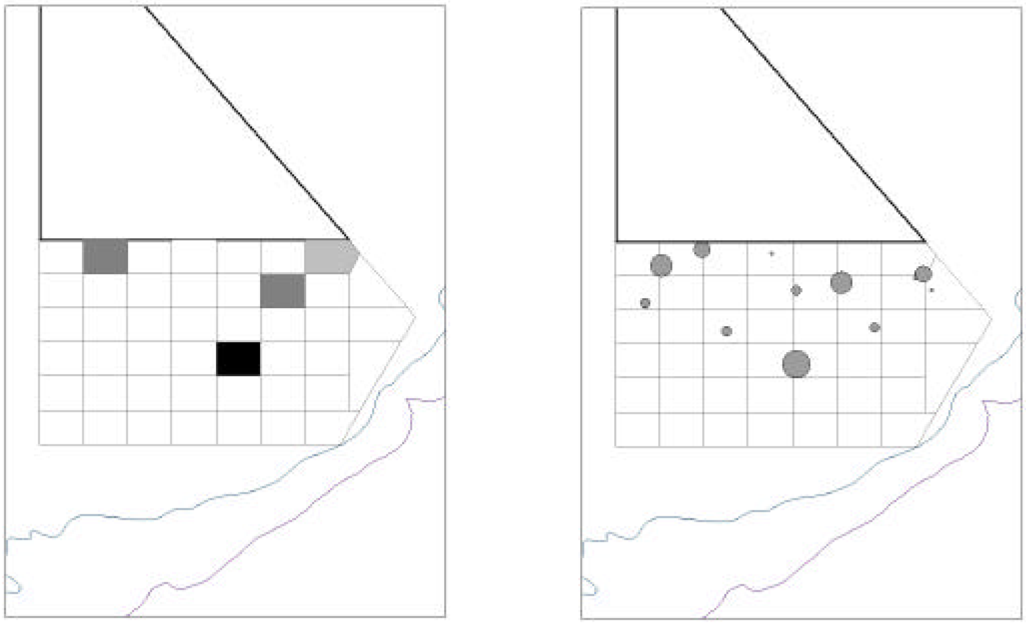


Figure 140 – Mean wt per tow per grid block, total wt per tow for Cod.

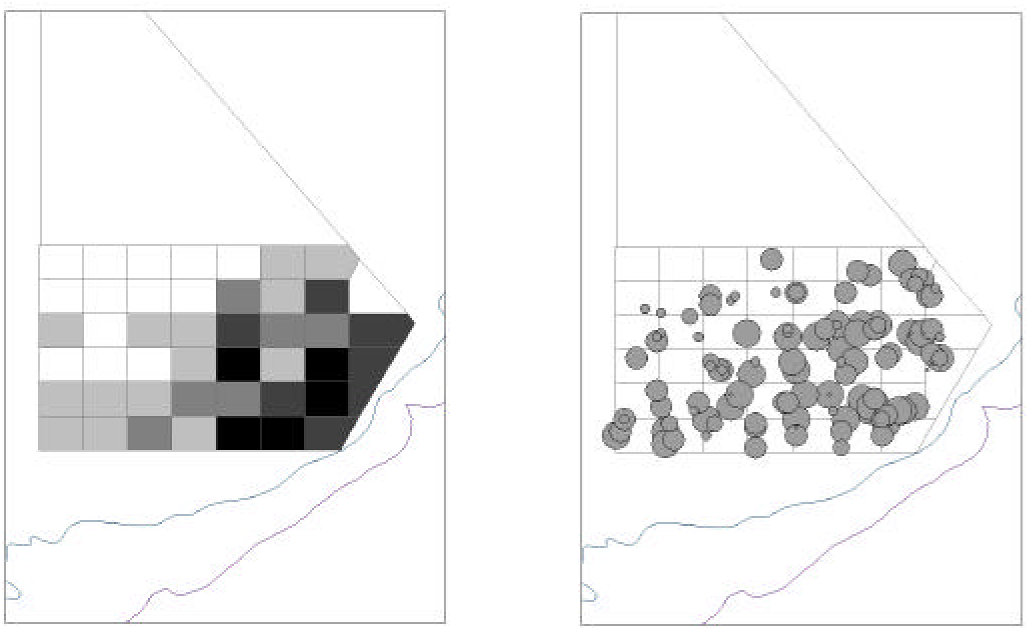


Figure 141 – Mean wt per tow per grid block, total wt per tow for Monkfish.

Bycatch rates inside the grid blocks with the highest yellowtail flounder yield tended to be lower for most key species. Cod, monkfish, barndoor skate and little skate all had a lower mean weight per tow value inside the potential area for targeting yellowtail flounder. Haddock and little skate both showed marginal increases in this area.

Using the same approach as in section 5.2.4.6.1, estimates of likely bycatch were developed for a number of species. Table 112 shows the mean weight per tow, total weight, and number of tows for bycatch species. The figures in the left column represent the mean weight per tow per grid block for seven key species (including yellowtail flounder). Those in the right represent the total pounds caught on each individual tow. Locations marked are the latitude/longitude for the start of each tow. The assumed amount of yellowtail available to this access program fishery is between 4,000 and 5,000 metric tons. If the entire Georges Bank yellowtail TAC were to be caught inside the access program area, a potential maximum of 8,000 metric tons could be caught. If the US/CA Resource Sharing Understanding is implemented, it would cap yellowtail catches in this area according to the terms of the agreement. Table 114 estimates number of trips, and builds on Table 113 to establish upper and lower bounds for bycatch of selected species. These bycatch estimates are not necessarily additional discards of these species. It is not known how much of the effort inside CAII will substitute for trips that previously occurred outside the area, and the amount of bycatch outside the areas is not know with as much detail. For example, if all the trips inside the area represent additional effort, then the bycatch estimates do represent additional discards. If they replace trips with bycatch that previously occurred outside the area, then the entire amount may not be additional discards.

Bycatch of skate species can be expected in this access program. Two skate species that are overfished – thorny and smooth skates – were not identified in the experimental fishery data analyzed to date. Winter skate is also overfished, and was caught in the experiment. Finally, bardnoor skates are also overfished and a potential candidate for ESA listing. Both winter and barndoor skates were caught in the experimental fishery and can be expected to be caught in a commercial fishery in this area.

SPECIES	Mean wt per tow	Total wt	Number of tows
BUTTERFISH	0.4	5.7	13
CLAM, SURF	1.0	1.0	1
COD, ATLANTIC	15.9	190.5	12
CRAB, CANCER, NK	1.3	2.5	2
CRAB, JONAH	1.2	23.6	19
CRAB, NK	0.9	3.5	4
CRAB, ROCK	2.0	2.0	1
CUNNER	4.0	4.0	1
DOGFISH, SMOOTH	6.0	6.0	1
DOGFISH, SPINY	5.3	101.5	19
FLOUNDER, AMERICAN PLAICE (DAB)	2.8	66.0	24
FLOUNDER, FOURSPOT	1.6	173.6	107
FLOUNDER, SUMMER (FLUKE)	9.3	648.8	70
FLOUNDER, WINDOWPANE (SAND DAB)	9.3	785.9	85
FLOUNDER, WINTER (BLACKBACK)	59.3	8,532.5	144
FLOUNDER, WITCH (GREY SOLE)	3.2	60.6	19
FLOUNDER, YELLOWTAIL	118.8	37,644.5	317
HADDOCK	53.1	1,062.6	20
HAKE, RED (LING)	2.6	39.2	15
HAKE, SILVER (WHITING)	0.9	34.4	38
HAKE, WHITE	2.9	48.8	17
LOBSTER, AMERICAN	29.4	2,847.5	97
MONKFISH, ROUND	38.5	6,813.0	177
OCEAN POUT	1.0	1.0	1
POLLOCK	11.0	22.0	2
PUFFER, NK	1.0	1.0	1
RAY, TORPEDO	14.5	29.0	2
SCALLOP, SEA* (wt in shell)	252.9	31,361.3	124
SCULPIN, LONGHORN	7.0	926.0	132
SEA RAVEN	5.9	419.7	71
SEA ROBIN, NK	1.3	3.8	3
SEA URCHIN	0.6	1.1	2
SHELL, NK	123.3	740.0	6
SKATE, BARNDOOR	23.4	3,340.2	143
SKATE, LITTLE	116.8	21,482.0	184
SKATE, WINTER	174.2	32,569.5	187
SPONGE	14.0	70.0	5
SQUID, LONG FINNED (LOLIGO)	0.6	20.0	32
SQUID, SHORT FINNED (ILLEX)	0.6	17.9	30
STARFISH (SEASTAR)	370.6	14,081.5	38

Table 112 – Species caught during experimental CAII fishery, Sep-Dec 2002. Data provided by the Manomet Center for Conservation Sciences.

SPECIES	towlbs	daylbs	triplbs
BUTTERFISH	0.14	1.11	2.40
COD, ATLANTIC	4.80	38.40	83.06
CRAB, CANCER, NK	0.38	3.06	6.62
CRAB, JONAH	0.15	1.20	2.60
CUNNER	0.30	2.40	5.19
DOGFISH, SPINY	2.96	23.70	51.26
FLOUNDER, AMERICAN PLAICE (DAB)	2.12	16.98	36.73
FLOUNDER, FOURSPOT	4.14	33.15	71.70
FLOUNDER, SUMMER (FLUKE)	13.99	111.90	242.04
FLOUNDER, WINDOWPANE (SAND DAB)	26.94	215.52	466.17
FLOUNDER, WINTER (BLACKBACK)	379.20	3033.60	6561.74
FLOUNDER, WITCH (GREY SOLE)	1.60	12.78	27.64
FLOUNDER, YELLOWTAIL	1992.76	15942.06	34483.00
HADDOCK	69.11	552.90	1195.93
HAKE, RED (LING)	0.64	5.10	11.03
HAKE, SILVER (WHITING)	1.23	9.81	21.22
HAKE, WHITE	1.22	9.75	21.09
LOBSTER, AMERICAN	34.31	274.50	593.75
MONKFISH, ROUND	122.10	976.80	2112.84
OCEAN POUT	0.08	0.60	1.30
RAY, TORPEDO	1.35	10.80	23.36
SCALLOP, SEA* (wt in shell)	399.26	3194.10	6908.90
SCULPIN, LONGHORN	26.58	212.64	459.94
SEA RAVEN	12.64	101.10	218.68
SEA ROBIN, NK	0.26	2.10	4.54
SEA URCHIN	0.01	0.06	0.13
SHELL, NK	27.00	216.00	467.21
SKATE, BARNDOOR	52.76	422.10	913.01
SKATE, LITTLE	456.00	3648.00	7890.70
SKATE, WINTER	651.15	5209.20	11267.61
SPONGE	0.38	3.00	6.49
SQUID, LONG FINNED (LOLIGO)	0.27	2.13	4.61
SQUID, SHORT FINNED (ILLEX)	0.27	2.13	4.61
STARFISH (SEASTAR)	321.49	2571.90	5563.07

Table 113 – Pounds per tow, day and trip for an average yellowtail trip fishing in the highest yellowtail catch rate areas for a modeled access program fishery.

SPECIES	All access program areas, mean wt per tow	High YT areas, mean wt per tow	% difference
BUTTERFISH	0.44	0.46	5%
CLAM, SURF	1.00	.	.
COD, ATLANTIC	15.88	10.67	-33%
CRAB, CANCER, NK	1.25	.	.
CRAB, JONAH	1.24	1.02	-18%
CRAB, NK	0.88	2.00	129%
CRAB, ROCK	2.00	.	.
CUNNER	4.00	4.00	0%
DOGFISH, SMOOTH	6.00	.	.
DOGFISH, SPINY	5.34	4.94	-8%
FLOUNDER, AMERICAN PLAICE (DAB)	2.75	2.02	-26%
FLOUNDER, FOURSPOT	1.62	1.67	3%
FLOUNDER, SUMMER (FLUKE)	9.27	9.33	1%
FLOUNDER, WINDOWPANE (SAND DAB)	9.25	12.83	39%
FLOUNDER, WINTER (BLACKBACK)	59.25	105.33	78%
FLOUNDER, WITCH (GREY SOLE)	3.19	2.37	-26%
FLOUNDER, YELLOWTAIL	118.75	276.77	133%
HADDOCK	53.13	92.15	73%
HAKE, RED (LING)	2.61	1.70	-35%
HAKE, SILVER (WHITING)	0.90	1.36	51%
HAKE, WHITE	2.87	2.32	-19%
LOBSTER, AMERICAN	29.36	18.30	-38%
MONKFISH, ROUND	38.49	39.71	3%
OCEAN POUT	1.00	1.00	0%
POLLOCK	11.00	.	.
PUFFER, NK	1.00	.	.
RAY, TORPEDO	14.50	18.00	24%
SCALLOP, SEA	252.91	190.13	-25%
SCULPIN, LONGHORN	7.01	8.44	20%
SEA RAVEN	5.91	7.02	19%
SEA ROBIN, NK	1.27	1.75	38%
SEA URCHIN	0.55	0.10	-82%
SHELL, NK	123.33	120.00	-3%
SKATE, BARNDOOR	23.36	19.01	-19%
SKATE, LITTLE	116.75	116.92	0%
SKATE, WINTER	174.17	163.81	-6%
SPONGE	14.00	5.00	-64%
SQUID, LONG FINNED (LOLIGO)	0.63	0.39	-37%
SQUID, SHORT FINNED (ILLEX)	0.60	0.51	-15%
STARFISH (SEASTAR)	370.57	476.28	29%

Table 114 – Bycatch rates for all species caught during experimental yellowtail exemption fishery. Data provided by the Manomet Center for Conservation Sciences.

SPECIES	250 trips	*320 trips*	400 trips
BUTTERFISH	0.3	***0.4***	0.4
COD, ATLANTIC	9.4	***12.1***	15.1
CRAB, CANCER, NK	0.8	***1.0***	1.2
CRAB, JONAH	0.3	***0.4***	0.5
CUNNER	0.6	***0.8***	0.9
DOGFISH, SPINY	5.8	***7.4***	9.3
FLOUNDER, AMERICAN PLAICE (DAB)	4.2	***5.3***	6.7
FLOUNDER, FOURSPOT	8.1	***10.4***	13.0
FLOUNDER, SUMMER (FLUKE)	27.5	***35.1***	43.9
FLOUNDER, WINDOWPANE (SAND DAB)	52.9	***67.7***	84.6
FLOUNDER, WINTER (BLACKBACK)	744.1	***952.4***	1,190.5
FLOUNDER, WITCH (GREY SOLE)	3.1	***4.0***	5.0
FLOUNDER, YELLOWTAIL	3,910.3	***5,005.2***	6,256.5
HADDOCK	135.6	***173.6***	217.0
HAKE, RED (LING)	1.3	***1.6***	2.0
HAKE, SILVER (WHITING)	2.4	***3.1***	3.9
HAKE, WHITE	2.4	***3.1***	3.8
LOBSTER, AMERICAN	67.3	***86.2***	107.7
MONKFISH, ROUND	239.6	***306.7***	383.4
OCEAN POUT	0.2	***0.2***	0.2
RAY, TORPEDO	2.7	***3.4***	4.2
SCALLOP, SEA	783.5	***1002.8***	1,253.5
SCULPIN, LONGHORN	52.2	***66.8***	83.5
SEA RAVEN	24.8	***31.7***	39.7
SEA ROBIN, NK	0.5	***0.7***	0.8
SEA URCHIN	0.0	***0.0***	0.0
SHELL, NK	53.0	***67.8***	84.8
SKATE, BARNDOOR	103.5	***132.5***	165.7
SKATE, LITTLE	894.8	***1,145.3***	1,431.7
SKATE, WINTER	1,277.7	***1,635.5***	2,044.4
SPONGE	0.7	***0.9***	1.2
SQUID, LONG FINNED (LOLIGO)	0.5	***0.7***	0.8
SQUID, SHORT FINNED (ILLEX)	0.5	***0.7***	0.8
STARFISH (SEASTAR)	630.8	***807.5***	1009.4

Table 115– Modeled bycatch estimates for yellowtail access program fishery (totals in metric tons).

SNE/MA Winter Flounder Incidental Catch Program
This special access program is specifically designed to convert discards of small amounts of winter flounder into landings. As such, it should reduce bycatch of winter flounder. In calendar year 2001, roughly 2,000 trips reported discards of small quantities of winter flounder totaling about 200 mt.

US/CA Resource Sharing Understanding Special Access Program
This program alters management measures in the eastern area of Georges Bank in order to facilitate harvesting of the U.S. share of eastern Georges Bank cod and haddock, and Georges Bank yellowtail flounder. The impacts of these measures on bycatch are difficult to estimate. Viewed in isolation, some of the proposed measures will probably increase discards of cod, skates, and other species. If effort shifts into the eastern Georges Bank area as a result of this program, it is possible that effort will move off of stocks or out of areas that have more serious discard concerns. For example, if vessels chose to fish in this area rather than an area with a low yellowtail flounder trip limit, it is very possible that overall discards of yellowtail flounder will decline. There is not enough information to predict this type of interaction with any certainty.

<u>Effort Adjustments:</u> Credits for steaming time, or differential DAS counting, will result in increases in fishing effort. In general, increases in effort are expected to increase the total amount of discards (assuming discard rates do not change).

<u>Gear</u>: Trawl cod end mesh requirements may be lowered to match those used by Canadian vessels. Absent changes in minimum fish sizes, reductions in mesh size are likely to increase discards as more undersized fish will be retained.

<u>Access to Closed Area II</u>: Allowing access to the northern part of CA II may increase discards, but there is little information available to objectively evaluate this concern. Given the experience obtained from several experiments in the southern part of CAII, higher concentrations of cod and skates are likely in the closed area and, if they cannot be avoided by vessels fishing for haddock, will be discarded in increased numbers.

The proposed US/CA Resource Sharing Understanding Special Access Program will, if approved, allow fishing in the northern part of CAII. Vessels fishing in this area will probably catch several skate species. Rothschild and Brown (2002) plotted skate CPUEs for tows conducted during a trawl fleet study. The data suggest that high skate CPUEs are more broadly distributed than haddock CPUEs (see Figure 116 and Figure 142). Areas for high skate CPUEs are found along the northern edge of GB, but are also found up on the bank itself. There is no information on catches inside the northern half of CAII itself. Whether this program will increase bycatch of skates and other species depends on what incentives are offered to fishing in the area. Generous credits for steaming time or DAS differentials may result in an increase in overall effort. Any increase in effort would probably result in an increase skate catch. The use of specific gear (such as a haddock separator trawl) would be expected to reduce the catch of skates, but ongoing studies have not been completed so the exact reduction is unknown.

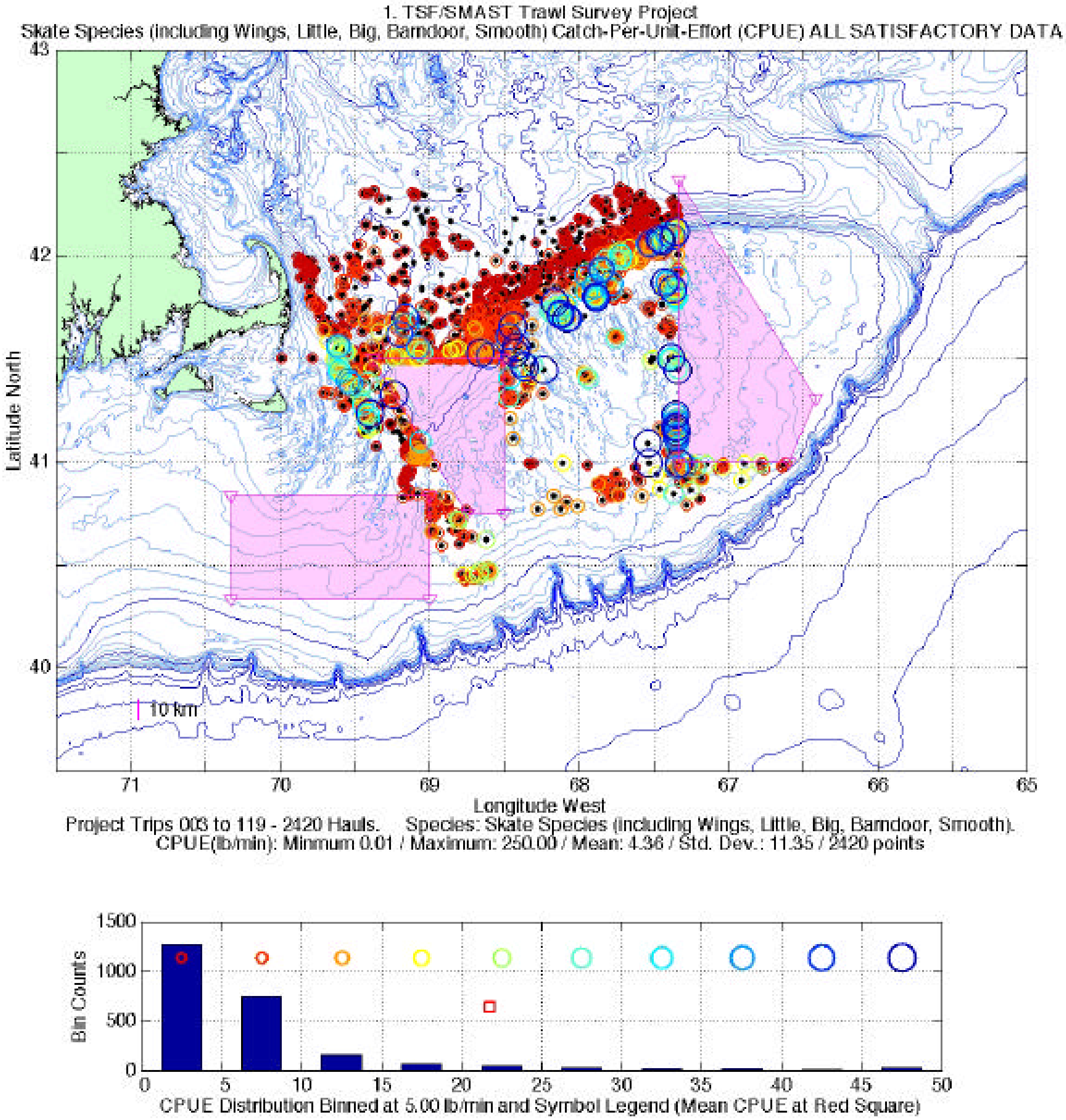


Figure 142 - Observed skate CPUE from TSF/SMAST Trawl Survey Project (from Rothschild and Brown 2002)

Hook Gear Closed Area I Special Access Program

This program will allow hook vessels to target haddock in a defined area of Closed Area I. An experimental fishery is being conducted for this program, but results are not yet available. There is no information available to determine the impacts of this program on bycatch.

5.2.8.2.6 Closed Area Administration

The proposed action does not make any changes to the gear allowed in closed areas (except for habitat protection, see below). Alternatives in this category are not likely to have direct impacts on bycatch. Some of the alternatives may increase the number of gears allowed into closed areas. It is possible there may be some increase in bycatch as a result, but the requirements for access are that the gear demonstrates it does not retain groundfish so these impacts should be minimal. Impacts on other species may not. For example, aggregations of skates in the closed areas may be susceptible to harvest by gear that does not take groundfish. This will have to be evaluated on a case-by-case basis.

5.2.8.2.7 Flexible Area Action System

The proposed action eliminated the FAAS. The flexible area action system was designed to rapidly implement a closed area in response to transient conditions in the fishery – such as unexpectedly high discard rates resulting form concentrations of juvenile fish. The alternative that eliminates this system removes a tool that could be used to reduce bycatch or bycatch mortality. In reality, however, a closure has never been implemented under this system and there is, in effect, no differential impact on bycatch for either keeping or eliminating the system.

5.2.8.2.8 DAS Leasing

The proposed action adopts a DAS leasing program. The amount of bycatch is related to both fishing and regulatory practices. With respect to fishing activities, the amount of bycatch is a function of at least these factors:

Gear (both type and size/quantity)
Target species
Area fished
Effort
Season/time of the year
Stock status/year class effects

Murawksi (1994) analyzed factors affecting discard rates in the mixed species otter trawl fishery from 189 through 1992 and concluded that the main factors affecting all species discard rates were year (reflecting the influence of stock conditions), primary species sought, mesh size, and tow duration (longer tows resulted in less discards).

DAS leasing alternatives would allow the transfer of DAS from one permit to another. The proposed measures include a wide range of possible restrictions on the transfer of those DAS. DAS leasing could affect bycatch or bycatch rates if it results in changes in fishing activity, such as:

Transfer of inactive DAS to a vessel actively fishing
Transfer of DAS from a vessel with a low bycatch rate (due to gear, target species, or area fished) to a vessel with a higher discard rate

As noted at the beginning of the discussion on bycatch impacts, the proposed measures are compared to the no action alternative. Under no action, most permits do not have any limits on the type of gear fished. In addition, there are no limits on where a permit can fish, when it can fish, or what it targets. Finally, permits are routinely transferred between owners – some permits becoming more active, others less so.

From this standpoint, the changes possible under any proposed DAS leasing program are not significantly different than those that can occur under the no action alternative, and thus the DAS leasing alternative is not expected to increase bycatch.

In addition, days at sea leasing only makes sense if an option is chosen which reduces effort. DAS leasing does not make sense to the fishermen under a hard TAC alternative, because it is possible that the TAC may be caught before the opportunity to use leased DAS. Given that there will be less effort in the fishery, bycatch will decline. Additionally, if more efficient vessels lease days at sea from less efficient vessels, bycatch will also decline. This is because efficient vessels are likely to have lower bycatch rates because it is costly to dispose of unwanted fish in terms of downtime from fishing. Therefore, any system which shifts effort from inefficient vessels to efficient vessels is likely to reduce bycatch.

5.2.8.2.9 Recreational Fishing Permits

The proposed action does not adopt a recreational fishing permit. The four options for a recreational fishing permit are unlikely to have a direct impact on bycatch or bycatch mortality. Three of the options require a federal fishing permit for groundfish. This may indirectly improve the understanding of recreational fishing bycatch. As discussed in section (Section 9.4.2.8.3.1), recreational fishing generates considerable bycatch for GOM cod and SNE winter flounder., though it is believed mortality in some cases is quite low. Requiring a recreational fishing permit will improve information on the number of fishermen. This may eventually improve the precision of recreational fishing landing and discard estimates.

5.2.8.2.10 "Running Clock" Alternatives

The proposed action does not change the current modified running clock. Trip or possession limits in this FMP are based on the time elapsed on a vessel's DAS clock. A "running clock" refers to a vessel allowing time to accumulate on its DAS clock in order to land a higher trip limit for a given amount of time actually spent fishing. This can be done either at the end of a trip if the vessel returns to port with more that the allowed trip limit for the time since sailing, or prior to a vessel leaving on a trip by starting its clock before departure (front-loading the clock). "Running clocks" provide fishermen a way to land fish that would have to be discarded under restrictive trip limits. They reduce bycatch by converting regulatory discards of a target species to landings. A more subtle way they may reduce discards is by allowing a way for fishermen to rapidly catch a high value species, which may reduce time spent actually fishing. "Running clocks" may not be a practicable measure for two reasons. First, some versions are considered difficult to enforce and administer. Second, trip limits are supposed to reduce mortality by modifying fishermen's behavior and encouraging them not to target a species. Measures that allow continued targeting weaken this effect.

No Action – Modified Running Clock
Retaining the current "running clock" provides a limited opportunity to convert discards to landings on short trips.

Industry Funded Weighmaster
This alternative expands the ability of a vessel to land more of its catch of a species with a trip/possession limit. No limit is placed on the amount that can be landed on one trip as long as the landing is monitored and verified. The verification process removes some of the enforcement concerns, making this a more practicable alternative. It should result in reduced bycatch for those species with trip limits by converting regulatory discards to landings. Vessel operators, however, may not choose to use this option if they

determine the requirements are too stringent (all trips must be landed at an approved weighmaster) or if the value of the landed catch is not sufficient to justify being charged additional DAS.

Extended Modified Running Clock
This proposal would extend the current "running clock" into one extra day, providing vessel operators additional flexibility to convert some discards into landings. This may provide a slight reduction in bycatch.

5.2.8.2.11 Observer Coverage

Two options to No Action were considered. The No Action option would not specify a desired level of coverage, while Option 2 expresses the Council's desire for a minimum level of coverage. Option 3 does the same, but provides NMFS more flexibility in responding to the Council's desire for improves observer coverage. No Action clearly does not improve understanding of bycatch. While the Council does not have mechanism to implement an observer program, the second and third options indicate the Council's promotion of adequate observer coverage for monitoring the fishery. A better understanding of bycatch should result from a minimum acceptable level of observer coverage. This should lead to the design and implementation of measures to address bycatch issues. The practicability of a minimum requirement for observer coverage depends on the level necessary for statistically valid estimates and the cost of that program. These are not issues within the Council's control. The proposed action adopts Option 3.

5.2.8.2.12 Day Gillnet Blocks out of the Fishery

The proposed action does not adopt any changes to these requirements. Alternatives in this section should not have any impacts on bycatch or bycatch mortality of groundfish. As discussed in the protected species section, removing the requirement to take blocks of time out of the fishery may increase bycatch of protected species, though the extent of that change in unclear.

5.2.8.2.13 DAS Counting

DAS counting alternatives are unlikely to have direct or indirect impacts on bycatch or bycatch mortality. The proposed action does not adopt any changes to DAS counting

5.2.8.2.14 Reporting Requirements

The proposed reporting requirement changes should not have any impacts on bycatch or bycatch mortality.

5.2.8.2.15 Open Access Handgear Permit Alternatives

There were four options for an open-access handgear permits. None of the options considered were expected to impact bycatch or bycatch mortality. The proposed action adopts Option 3.

5.2.8.2.16 Sector Allocation

This alternative is not a stand-alone alternative and must be implemented with one of the other alternatives. It establishes a structure for future consideration and approval of a cooperative sector within the groundfish fishery. As such, it does not immediately implement any specific measures and should have no impacts on bycatch. A sector system that relies on assigning a quota, that allows sector members to design the most efficient means to take that quota, while keeping in place any measures specifically designed to reduce bycatch, should further reduce bycatch. Sector participants will have an incentive to design measures that maximize their returns by reducing, as much as possible any discards. If a sector is implemented in the future, the specific measures adopted will have to be evaluated for their impact on bycatch.

5.2.8.2.17 Georges Bank Hook/Gillnet Sector

The proposed action adopts a GB hook sector, but does not adopt a GB gillnet sector. A specific sector alternative would be implemented in concert with another management alternative if this is adopted. In addition to the general benefits to bycatch that may result (as discussed in the previous section), the specific measures adopted by the sector may reduce bycatch. These provisions must be explained in the sector operating plan submitted for NMFS approval.

5.2.8.2.18 Gulf of Maine Inshore Conservation and Management Stewardship Plan

This proposal was not adopted. As discussed in the description of proposed measures, this alternative does not propose measures throughout the range of the fishery and must be adopted in concert with another alternative. The specific measures proposed can be evaluated for their impact on bycatch, but the overall impacts will depend on which other alternative is adopted.

Fishing Year
Starting the fishing year in July may reduce bycatch for the reasons discussed in section 5.2.8.2.1. The impacts may prove to be temporary as vessels adjust their DAS use to the new fishing year.

Possession/Trip Limit
Increasing the trip limit for GOM cod to 600 lbs./6,000 lbs. should provide a marginal reduction in bycatch compared to the no action alternative as explained in previous sections.

Effort Controls
Similar to Alternative 3, DAS allocations are reduced, but the allocated DAS will still be more than were used in 2001. Only if these reductions result in less DAS used can bycatch reductions be expected.

Observer Coverage
Observer coverage should improve understanding of bycatch, as explained in section 5.2.8.2.11. the level proposed in this alternative – 20 percent – is higher than any other proposal. This may result in estimates of bycatch that are more accurate and more precise, ultimately leading to better design of management measures that reduce bycatch. In addition, the recommendation to increase observer coverage on mid-water trawl vessels will expand the understanding of bycatch in other measures.

Gear Restrictions
The gear restrictions proposed in this alternative apply only to the inshore GOM. Any effects on bycatch will be limited to this area and the stocks caught in this area: primarily GOM cod, but also plaice, CC/GOM yellowtail , witch flounder, pollock, white hake, and GOM winter flounder.

<u>Trawl Gear</u>
Minimum mesh size proposed in this alternative is 6.5 inches and should reduce discards compared to the no action alternative. In addition, the alternative proposes a composite cod end, with square mesh on top and diamond mesh on the bottom. Preliminary information (Glass, pers. comm.) indicates these nets are

more selective for roundfish and flatfish, further reducing retention of undersized fish that must be discarded to comply with minimum size limits. The alternative also restricts the length of ground cables for trawl vessels in the inshore area. This will reduce the sweep width of a trawl, reducing catch rates and bringing them more in line with the daily possession limit. This should further reduce bycatch in the inshore area.

Impacts on bycatch of the ban on night dragging are unclear. There is some evidence from the limited data available that catch rates for many stocks are higher at night. Fishermen have repeatedly testified that this is particularly true for cod. A ban on night fishing, then, may reduce catch rates so that it is easier for fishermen to comply with the daily trip limit for cod, reducing discards.

Gillnets
The number of nets is reduced to 50 for both trip and day gillnet vessels. To the extent that this results in catch rates that are more closely matched to the daily possession limits, this measure should reduce bycatch compared to the no action alternative.

Hook Gear
The number of hooks per boat is reduced roughly in half from the no action alternative. This is effectively a reduction in effort for longline vessels and can be expected to reduce bycatch.

Summary
This alternative will reduce bycatch as compared to the no action alternative, primarily as a result of gear modifications but also due to limits on night fishing and effort controls.

5.2.8.3 Measures to Control Capacity

None of the alternatives to control capacity are expected to have a direct impact on bycatch or bycatch mortality. If a suite of measures is chosen that improves the matching of fishing capacity to the resource, there may be indirect benefits. With an appropriate pool of harvesters, the design of management measures may be simplified. Concepts such as "full-use" policies can be considered. Efforts to control capacity, then should reduce bycatch and bycatch mortality if successful. The form of those measures is unimportant, as long as capacity is better matched to the available resource.

The proposed action adopts the DAS reserve and DAS transfer alternatives.

5.2.8.4 Management Measures to Address Rebuilding Requirements

The alternatives evaluated in this section are designed primarily to reduce fishing mortality using a variety of tools. Many of these alternatives may have a direct impact on bycatch and/or bycatch mortality. In the following evaluation, the elements of each alternative are discussed and the probable impacts on bycatch or bycatch mortality evaluated. If a specific measure is used in more than one alternative, the bycatch impacts are only discussed in detail for the first occurrence, and then this discussion is referenced in later sections. There is very limited ability to provide quantitative estimates of the impacts of the measures. Alternatives are compared to the No Action alternative (regulations in place in fishing year 2001).

5.2.8.4.1 Proposed Action

Many of the measures proposed will reduce bycatch.

Effort Controls/DAS Restrictions

The proposed action adopts a DAS reserve baseline and then categorizes DAS into A, B, and C categories. B DAS are further categorized into B (regular) and B (reserve) DAS, with limits on their use.

The DAS reserve baseline reduces allocated DAS from about 131,000 in FY 2001 to about 68,000 in FY 2004. The allocated DAS in FY 2004 are further restricted. Sixty percent, or about 40,800, are classified as Category A DAS and can be used to target any groundfish stock, subject to other restrictions in the plan. The remainder are classified as B DAS and can only be used under certain conditions. On implementation of the plan, they can only be used in approved special access programs, though future framework actions may provide opportunities to use them to target healthy stocks.

In FY 2001, 65,275 DAS were used. While in FY 2002 DAS use declined to 41,410 DAS, DAS use increased by about sixteen percent early in fishing year 2003. If all available Category A DAS are used, it represents a thirty-seven percent reduction in effort. This is likely to significantly reduce discards and discard mortality from that in FY 2001 and probably compared to FY 2003. Compared to FY 2002, the level of effort is similar so there would not be expected to be much change in the discards as a result of a change in effort.

The use of Category B DAS could alter this conclusion. There are limited opportunities to use B DAS in special access programs, and those programs have tight limits on the amount of bycatch allowed. For this reason, the use of B DAS in special access programs is not expected to increase discards or discards mortality compared to FY 2001. The details have not been developed for the use of B (regular) DAS outside of a special access program. The concept is that those opportunities will be narrowly defined so as to avoid concerns over both discards and adverse effects on rebuilding programs.

Closed Areas

Closed areas as implemented August 1, 2002 are maintained. With the exception of closing the Cashes Ledge closed area for an additional six months, they are identical to the closed areas in place in fishing year 2001 and will not provide further benefits to bycatch reduction. The seasonal closed areas may result in additional bycatch reduction in the inshore GOM because of the May closure, as well as some small reductions in bycatch because of the expansion of the GB closure in May (compared to FY 2001).

Possession Limits

Trip/possession limits are proposed for GOM cod, GB cod, CC/GOM yellowtail flounder, haddock, and SNE/MA yellowtail flounder. In general, all trip/possession limits can be expected to increase bycatch if fishermen are unable to avoid catching that species. These regulatory discards can be avoided by using other measures. The following discussion compares the impact of trip/possession limits to the no action alternative. Any conclusions with respect to trip limits must be revisited as stock size changes. An increase in stock size is likely to increase catch rates, and, if trip limits are not adjusted, can be expected to result in increased discards unless effort shifts onto some other stock.

GOM cod: The no action alternative limit is 400 lbs./day and 4,000 lbs. per trip. This proposed action increases the trip limit to 800 lbs./4,000 lbs. The higher trip limit is specifically designed to reduce bycatch. By doubling the current trip limit, the discard rate should decline. The increased trip limit may encourage fishing effort to shift onto GOM cod. This may reduce discards on other stocks (such as CC/GOM yellowtail flounder). Future increases in the trip limit may be necessary as the stock (and presumably catch rates) increase. Additional analysis of the cod trip limit can be found in section 5.2.8.4.3.

GB Cod: This alternative reduces the GB cod trip limit to 1,000 lbs/day – 10,000 lbs/trip. Alternative 2 proposed a 500 lbs/day trip limit for this stock. The bycatch implications of that change are discussed in section 5.2.8.4.4. This analysis provides information on the likely impacts of the proposed action. While a trip limit model (based on catch per trip, not tow) suggests that any reduction of a GB cod trip below 2,000 lbs per day will increase discards, available observer and research program data suggest otherwise. Based on examination of observer and trawl study fleet catches, it appears that there is a limited ability for trawl vessels to reduce bycatch of cod on GB by targeting other species. The average catch of cod per tow, on tows not targeting cod but targeting other multispecies, averages just under 200 lbs per tow over the course of the year. Assuming vessels average five tows per day fishing, the 1,000 lb cod limit should not increase discards or discard mortality significantly.

SNE/MA yellowtail flounder: SNE/MA yellowtail flounder landings are not constrained by a trip/possession limit under the no action alternative, while the proposed action imposes a seasonal trip limit of 250 pounds from March through May, and 750 pounds the remainder of the year. Figure 145 shows the results of a trip limit analysis for this stock. While the analyzed alternatives are based on a year round trip limit and not the seasonal proposal, it is clear that the 250 pound trip limit is likely to significantly increase discards compared to the no action alternative – discards may prove to be twice as high as landings, unless some unknown seasonal effect limits the impacts. The limit of 750 pounds for the remainder of the year will not result in bycatch as high as the 250 pound limit, but will still increase bycatch over that in under the no action alternative.

CC/GOM yellowtail flounder

This alternative establishes a low trip limit for this stock. Absent other measures, it will increase discards. One change that may mitigate these impacts is the raising of the GOM cod trip limit. This may shift effort off CC/GOM yellowtail flounder and, to the extent cod can be caught without catching yellowtail, it may reduce discards.

Gear Restrictions

In all management areas, the proposed action increases the minimum size of permissible diamond mesh by one-half inch for trawl gear. It also increases the minimum size for gillnet gear in the GOM-GB and SNE mesh areas. Increases in mesh in the New England multispecies fishery reduce discards, as reported by Murawski (1996). This general observation is also supported by an examination of the discard data presented in Volume II. There is a general trend in reduced discards, particularly of juvenile fish, since 1994 and the adoption of increased mesh sizes in the multispecies fishery.

This alternative also continues the prohibition on the use of de-hooking devices on longline vessels, which may serve to reduce bycatch mortality in this fishery, though the impacts are not well documented.

Minimum Fish Sizes

This alternative increases the minimum fish size for GOM cod to 22 inches for commercial fishermen. This is approximately the size where 10 percent of the cod that encounter a net are expected to be retained. This is a lower percentage than the standard use for Amendments 5 and 7, which set minimum fish size at the point that 25 percent of the cod encountering the net were expected to be retained. This measure may actually increase discards compared to those that would result with a 19 inch minimum size.

Some small amounts of fish between 19 and 22 inches are likely to be retained even in the increased mesh size, and the increase in minimum size will require those fish to be discarded.

Summary
The proposed action will reduce bycatch and bycatch mortality compared to the no action alternative, primarily because of reductions in effort and additional gear restrictions. The provisions for the use of B regular DAS, and careful monitoring of the use of B DAS in special access programs, will be necessary for this conclusion to continue to be valid.

5.2.8.4.2 No Action Alternative

This alternative was not selected. The No Action alternative continues the measures in place during fishing year 2001 (see Section 4.1.5.1). The impacts of those measures on bycatch are reflected in the observed levels of bycatch described in section 9.4.2.8. These measures reduced bycatch in this fishery by a significant amount in recent years through a combination of seasonal and year round closed areas, effort controls, and gear modifications (large mesh, limits on number of hooks and gillnets, etc.).

5.2.8.4.3 Alternative 1 – Up to 65% Reduction in Used DAS

This alternative was not selected. Many of the measures proposed for this alternative would have impacts on bycatch.

Effort Controls/DAS Reductions
This alternative reduces fishing effort by up to 65% from that used in fishing year 2001. This measure is likely to significantly reduce discards and discard mortality of all bycatch species by reducing time fishing and by reducing total catch. It may also reduce the rate of discards. Fishermen with limited time available to fish will attempt to maximize their return on every trip and will attempt to convert any discards into landings. There is also differential DAS counting in the SNE/MA yellowtail flounder stock areas. These further effort reductions will also contribute to reduced bycatch.

Closed Areas
Closed areas as implemented August 1, 2002 are maintained. With the exception of closing the Cashes Ledge closed area for an additional six months, they are identical to the closed areas in place in fishing year 2001 and will not provide further benefits to bycatch reduction. The seasonal closed areas and may result in additional bycatch reduction in the inshore GOM because of the May closure.

Possession Limits
Trip/possession limits are proposed for GOM cod, GB cod, CC/GOM yellowtail flounder, haddock, and SNE/MA yellowtail flounder. In general, all trip/possession limits can be expected to increase bycatch if fishermen are unable to avoid catching that species. These regulatory discards can be avoided by using other measures. The following discussion compares the impact of trip/possession limits to the no action alternative.

GOM cod: The no action alternative limit is 400 lbs./day and 4,000 lbs. per trip. This alternative proposes increasing the trip limit to 800 lbs./4,000 lbs. The higher trip limit is specifically designed to reduce bycatch during a period that cod aggregate for spawning. By doubling the current trip limit, the discard rate should decline. The increased trip limit may encourage fishing effort to shift onto GOM cod.

The change in the trip/maximum possession limit is incorporated into the closed area model. This measure can also be analyzed independently, however, to estimate the different impacts between various trip limits. A range of trip limit alternative were examined using this. The results suggest the changes in discard rate that may result from revising the trip/possession limit. Trip/possession limits reduce mortality only if fishermen alter behavior because of the limits. If they continue to fish in a way that catches cod, and merely discard the overage, there is no benefit to a trip limit. It is not possible to predict how fishermen will react to changes in a trip limit. In order to gain a sense of the mortality and bycatch impacts that may result from changing the GOM cod trip limit, trip-level behavior of fishermen was modeled using the observed trips that took place in fishing years 1996 and 1997. These years were chosen because fishing activity was not constrained by low trip limits. The trips were examined to determine how the proposed trip limit would affect fishing activity if fishermen are assumed to base their decision to fish on maximizing revenue. The basic premise is that a trip would continue to take place, and catch cod, if the value of other species caught on the trip is sufficient to cover costs. Three different assumptions were made for labor costs. In this instance, cod over the trip limit is assumed discarded. If the catch of other species will not cover costs, the trip is ended and the additional cod caught is considered "savings."

The analysis indicates that all of the trip limit alternatives (except for the no action 400/4,000) evaluated are virtually indistinguishable from one another in terms of total catch but that they all are greater than the status quo (under three different scenarios for labor costs). This illustrates that changing the trip limit will not be mortality- or catch-neutral. Thus, changing the trip limit is not merely a case of converting discards into landings. There is, of course, an element to this effect for many trips, but an increase in the trip limit makes formerly marginal trips profitable and results in increased effort. These results are also illustrated in Figure 143. Examining this figure shows that there are generally "clouds" of results from the various models, indicating the range of results for the different trip limit options and the different assumptions of costs. The line marking a 10% mortality reduction shows the lowest mortality reduction likely to result from the current trip limit. To be equivalent to the current trip limit's effect on mortality, all the points of one of the options should be to the right of this line. Clearly, the options are likely to result in an increase in fishing mortality. Increasing the trip limit will make more trips profitable and will provide an incentive for more targeting of cod.

Changing the trip limit does, however, significantly reduce the ratio of fish discarded to fish kept. All of the alternatives should cut in half the discard to keep ratio. The results of the analysis indicate that the maximum cap is not as effective as holding the cap down while increasing the daily limit. All alternatives in the 700 - 800 pound range result in discard levels that range between 35 and 50 percent regardless of the maximum cap. The discard to keep ratio declines as the daily trip limit is increased. The results indicate that if the Council is seeking to get some control over discarding increasing the maximum cap is not as effective as holding the cap down while increasing the daily limit. There is a consistent pattern where all sensitivity runs generate discard rates in excess of 60 percent of landings when the daily limit is 500 pounds or less. All alternatives in the 700 - 800 pound range result in discard levels that range between 35 and 50 percent regardless of the maximum cap.

The model may under-estimate one possible behavioral response that may result in additional bycatch reductions. If fishermen end a trip after reaching a targeted revenue level that is lower than that expected by the model, then additional "savings" of cod and other discarded species may result. Fishermen have testified at Groundfish Committee meetings that a cod trip limit in the range of 800 to 1,000 pounds per day is enough for a "day's pay," and that after catching this amount many fishermen will choose to end their trip, avoiding further discards. As a result, the increase in mortality (relative to the status quo) may not be as great as that predicted using the model.

To summarize the results of the analysis for the options under consideration:

- The proposed increase in trip limits will result in higher catches than the current trip limit (400 pounds per day/4,000 pounds per trip). This may not occur if fishermen end their trips after reaching the new trip limit because they have earned enough revenue to make the trip profitable.
- The proposed increase will convert some discards to landings, and all should cut the discard to kept ratio roughly in half compared to a 400 lb./4,000 lb. trip limit.

GB Cod
This alternative keeps the GB cod trip limit at 2,000 lbs. day/20,000 lbs. trip and will not change the impact on discards. Reductions in the daily limit will increase bycatch, as demonstrated in Figure 144.

SNE/MA yellowtail flounder
SNE/MA yellowtail flounder landings are not constrained by a trip/possession limit under the no action alternative, while Alternative 1 imposes a seasonal trip limit of 250 pounds from March through May, and 750 pounds the remainder of the year. Figure 145 shows the results of a trip limit analysis for this stock. While the analyzed alternatives are based on a year round trip limit and not the seasonal proposal, it is clear that the 250 pound trip limit is likely to significantly increase discards compared to the no action alternative – discards may prove to be twice as high as landings, unless some unknown seasonal effect limits the impacts. The limit of 750 pounds for the remainder of the year will not result in bycatch as high as the 250 pound limit, but will still increase bycatch over that in under the no action alternative.

CC/GOM yellowtail flounder
This alternative establishes a low trip limit for this stock. Absent other measures, it will increase discards. The trip limit is combined with gear requirements that should minimize discards.

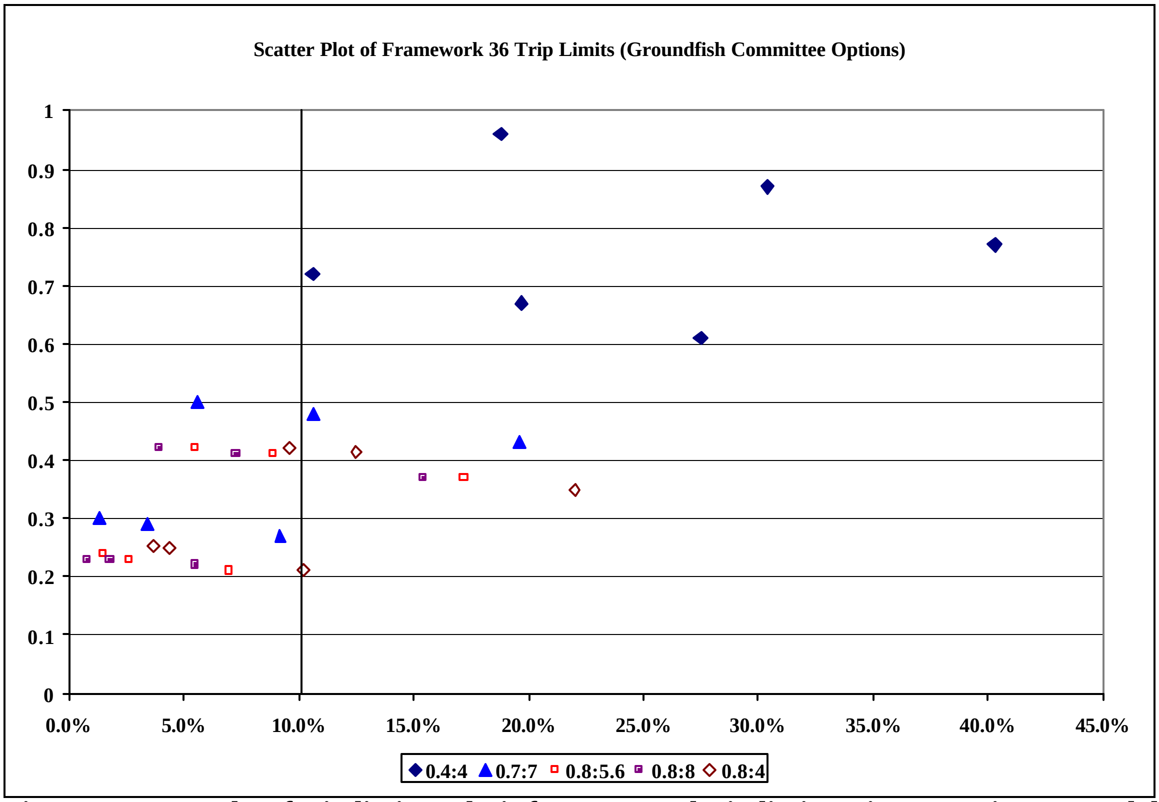


Figure 143 – Results of trip limit analysis for GOM cod trip limit options. Y-axis: expected discard rate. X-axis: reduction in mortality compared to no trip limit.

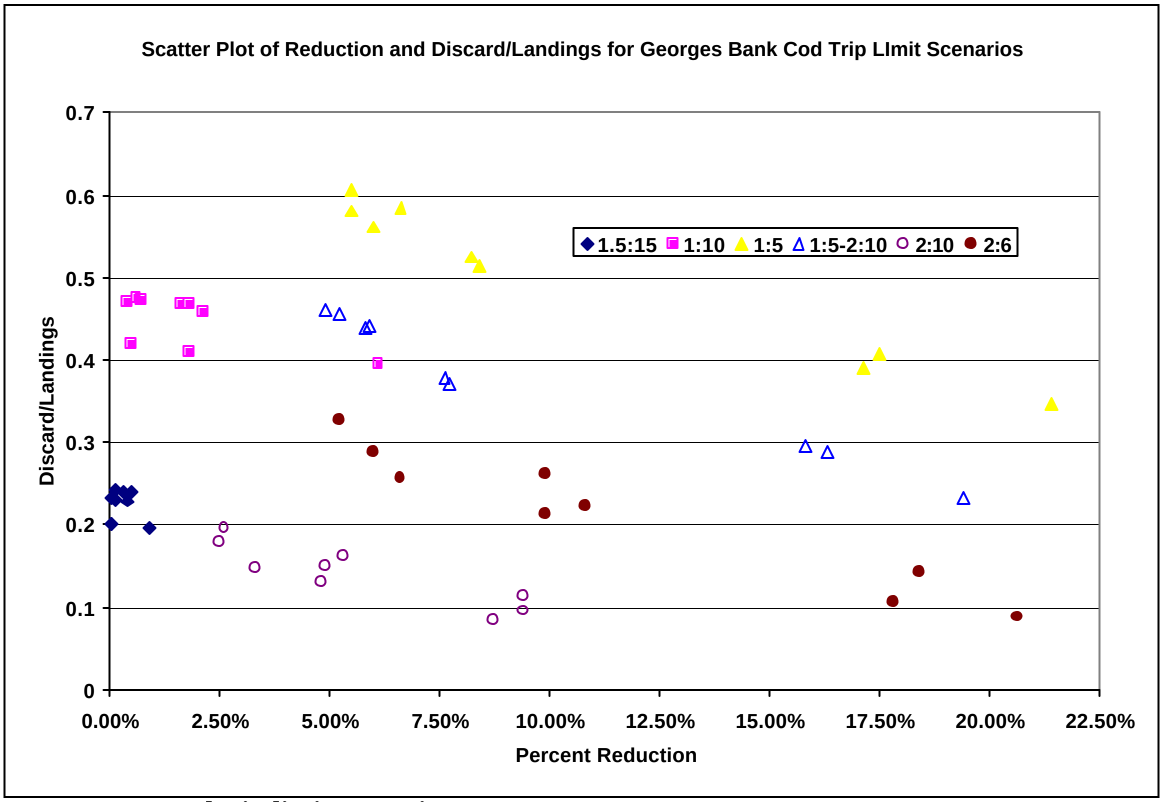


Figure 144 - GB cod trip limit scenarios

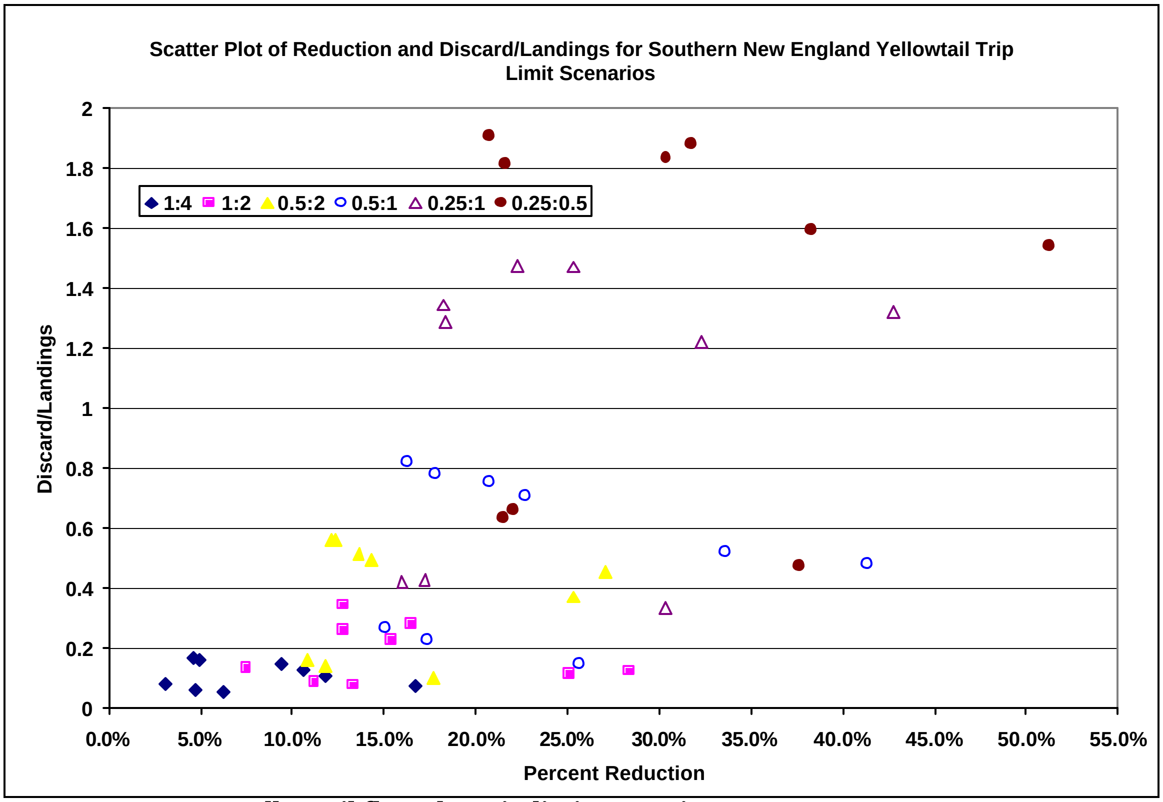


Figure 145 –SNE/MA yellowtail flounder trip limit scenarios

Gear Restrictions

In all management areas, the proposed action increases the minimum size of permissible diamond mesh by one-half inch for trawl gear. It also increases the minimum size for gillnet gear in the GOM-GB and SNE mesh areas. Increases in mesh in the New England multispecies fishery reduce discards, as reported by Murawski (1996). This general observation is also supported by an examination of the discard data presented in Volume II. There is a general trend in reduced discards, particularly of juvenile fish, since 1994 and the adoption of increased mesh sizes in the multispecies fishery.

This alternative also continues the prohibition on the use of de-hooking devices on longline vessels, which may serve to reduce bycatch mortality in this fishery, though the impacts are not well documented.

Other gear restrictions that may reduce discards include the use of raised-footrope trawl in certain areas. This should reduce discards of CC/GOM yellowtail flounder that would other wise result from the low trip limits. In addition, there may be some reduction in discards resulting from the allowance of fewer gillnets.

Minimum Fish Sizes

This alternative increases the minimum fish size for GOM cod to 22 inches for commercial fishermen. This is approximately the size where 10 percent of the cod that encounter a net are expected to be retained. This is a lower percentage than the standard use for Amendments 5 and 7, which set minimum fish size at the point that 25 percent of the cod encountering the net were expected to be retained. This measure may actually increase discards compared to those that would result with a 19 inch minimum size. Some fish between 19 and 22 inches are likely to be retained even in the increased mesh size, and the increase in minimum size will require those fish to be discarded.

Summary
Alternative 1 will reduce bycatch and bycatch mortality compared to the no action alternative, primarily because of reductions in effort and additional gear restrictions.

5.2.8.4.4 Alternative 2

Many of the measures proposed in this alternative are similar to those in Alternative 1 and the impacts will only be briefly described. This alternative was not selected.

Effort Controls
This alternative reduces DAS allocations rather than DAS used. Allocations are reduced 20 percent from the baseline allocations implemented August 1, 2002, with a possible additional 10 percent reduction for vessels fishing in the GOM. If all allocated DAS are used, the number of DAS used will be similar to DAS used in 2001 and there would only be marginal reductions expected in bycatch. Based on DAS use during the first six months of fishing year 2002, all allocated DAS are not likely to be used unless a DAS leasing program is implemented. To the extent DAS use is less than that in 2001, bycatch may be reduced, but it is not clear that this will actually occur.

Closed Areas
The same year round and seasonal closed areas are used that are in Alternative 1 and should have similar impacts on bycatch.

Possession Limits

<u>GOM Cod</u>
The proposed limit of 500 lbs./4,000 lbs. should marginally reduce discards compared to the no action alternative. Compared to Alternative 1, more GOM cod discards should be expected.

<u>GB Cod</u>
Previous analyses suggest the proposed trip limit of 500 lbs./4,000 lbs will significantly increase discards of GB cod. Examination of Figure 144 shows that daily trip limits of 1,000 pounds result in discard to landings rations of 40 to 60 percent. A further reduction to 500 lbs./day will likely result in even higher discard ratios in the absence of any other measures adopted to reduce discards. This alternative will increase GB cod discards more than either the no action or other alternatives under consideration.

There has been some comment that trawl fishermen can alter behavior to reduce the increase in discards resulting from this lower daily trip limit. Earlier analyses were completed on a per trip basis, and thus did not capture the possibility that only certain tows of a trip are used to catch large amounts of cod – that is, that tows are used to "top off" the vessel's allowable cod possession limit. Examination of 2002 observer data determined that the average cod caught per tow on 1,301 tows from trips where cod was a target was 158 pounds. For those tows on trips where cod was not a target, the average was 120 pounds. Cod catches were not correlated (in any manner) with any other groundfish species, suggesting that the ability to avoid cod may in fact be limited. No cod was caught on only one-fifth of the tows, regardless whether cod was a target for the trip or not. On roughly 30 percent of the tows, the amount of cod caught was between 100 and 500 pounds. Less than 6 percent of the observed tows caught more than 500 pounds. Further analysis of the observed data – based on seasons or areas – may shed additional light on this issue. The data also reflect behavior that took place on observed trips in 2002, and may not completely describe the types of behavior that are possible.

The School of Marine Science and Technology (SMAST) at the University of Massachusetts-Dartmouth recorded tow-by–tow catches from trawl vessels during a research program in December 2000 – October 2001, and again from August 2002 through March 2003. In addition to recording detailed information on the location, catch, and duration of each tow, the target species for each tow was also identified. The results of this analysis clearly show that catches of cod are higher on tows where cod was the target species, averaging 597 pounds per tow. Consistent with the observer data, however, the catch of cod on tows targeting multispecies, but not cod, averaged 194 pounds over the course of the study. There was considerable variability over different quarters, with average cod catches ranging from 30 to 241 pounds per tow on tows targeting multispecies (but not cod). (Jakubiak, pers. comm.)

Both the observer data and the SMAST data suggest that it is difficult to completely avoid cod while fishing on Georges Bank, regardless of the target species. Both data sets show cod catches averaging between 100-200 pounds per tow. If vessels have a t least 4 tows per day, it is likely, then, that a trip limit of 500 pounds per day will increase discards from trawl vessels. The amount of increased discards will depend in large measure on how effectively trawlers can target their tows and avoid cod bycatch. While the SMAST study shows that targeting cod can increase cod catches, it also shows that is difficult to eliminate cod catches completely.

CC/GOM yellowtail flounder

There is no trip limit analysis available for CC/GOM yellowtail flounder. The proposed limit of 50 pounds is likely to significantly increase bycatch in the absence of other measures. It should be noted that there are gear requirements that may reduce the bycatch impacts of this proposed low trip limit, however, even with these gear modifications factored in, Table 117 and Table 118 show that discards are predicted to exceed landings by a wide margin under this trip limit.

In FY2001 9,916 trips landed yellowtail flounder. 6,302 of these trips landed greater than 50 lbs. Of these, the trip limit model predicts 9,113 trips will be profitable based on total landings of other species. Table 116 confirms that landings of species other than CCGOM yellowtail ensures that trips are profitable even under situations with high yellowtail discards.

CCGOM yellowtail	all other groundfish	days absent	n
> 50	3,655	1.97	3,724
50 - 100	1,655	1.40	1,306
101 - 250	2,210	1.60	1,951
251 - 500	3,099	1.82	1,132
501 - 1,000	3,796	1.92	865
1,001 - 5,000	9,844	3.11	736
5,001 - 10,000	17,377	5.80	118
> 10,000	16,922	6.25	84

Table 116 – Mean landings (lbs) per trip where CC/GOM yellowtail flounder was landed.

SNE/MA yellowtail flounder

The proposed trip limit for SNE/MA yellowtail flounder is the same as for Alternative 2. It is likely to significantly increase the discard rate for this stock, particularly during the months with a 250 pound limit (see Table 120 - Table 123, below).

Gear Restrictions

Mesh requirements and limits on the number of hooks and gillnets are the same as for Alternative 1. These should help to reduce bycatch in the same fashion. In addition, the requirement for a haddock separator trawl net on GB and in certain areas of the GOM should reduce discards of cod and flatfish. These nets may help vessels remain under the restrictive cod trip limits. The alternative also requires use of a flounder net, as specified by the Regional Administrator. Certain designs of net have been demonstrated to reduce cod catches and may also help reduce discards of these fish.

TAC Backstop

If TAC levels can be appropriately determined to take into account expected bycatch, then the hard TAC backstop in this alternative will further reduce bycatch. If the appropriate level cannot be determined, the TAC may increase discards as vessels are forced to discard catch of species for a TAC that has been reached while continuing to fish for species that have not met their TAC. The Hard TAC/Trip Limit model results for rebuilding alternative 2 are summarized below.

		70% Threshold				90% Threshold			
F_Rebuild	**Stock**	**Predicted Landings under trip limits**	**Predicted Discards under trip limits**	**Modeled Landings (Total)**	**Discards under zero retention option**	**Predicted Landings under trip limits**	**Predicted Discards under trip limits**	**Modeled Landings (Total)**	**Discards under zero retention option**
	GOM cod	292	507	2,156	1,478	44	223	2,441	1,300
	white hake	517	443	2,757	690	192	126	3,072	374
	SNE winter fl	66	596	1,634	1,526	8	216	2,023	1,204
	Am. plaice	144	547	1,762	2,092	24	207	2,104	2,079
	Stock	**Predicted Landings - 500 lbs trip limit**	**Predicted Discards - 500 lbs trip limit**	**Predicted Landings - 100 lbs trip limit**	**Predicted Discards - 100 lbs trip limit**	**Modeled Landings (Total)**	**Total Modeled Discards**	**Discards under zero retention option**	
	GB cod	598	1,215	54	632	652	1,847	6,504	
		Total Modeled Landings	**Total Modeled Discards**	**Total discards under zero retention option**					
	CCGOMyt	12	153	1,922					
		Predicted Landings May 1 - May 31	**Predicted Discards May 1 - May 31**	**Predicted Landings June 1 - Feb 28**	**Predicted Discards June 1 - Feb 28**	**Predicted Landings Mar 1 - Apr 30**	**Predicted Discards Mar 1 - Apr 30**	**Total Modeled Landings**	**Total Modeled Discards**
	SNEyt	172	1,493	396	188	0	140	568	1,821

Table 117 – Estimated landings and discards for stocks anticipated to reach the TAC thresholds (70 or 90%) under rebuilding alternative 2 input controls and the constant mortality rebuilding program.

Phased_F

Stock	Predicted Landings under trip limits	Predicted Discards under trip limits	Modeled Landings (Total)	Discards under zero retention option	Predicted Landings under trip limits	Predicted Discards under trip limits	Modeled Landings (Total)	Discards under zero retention option
GOM cod	700	420	3,312	715	206	163	3,565	570
white hake	517	443	2,757	690	192	126	3,072	374
SNE winter fl	234	669	2,342	941	58	243	2,768	602
Am. plaice	474	542	2,847	1,130	120	219	3,171	938

Stock	Predicted Landings - 500 lbs trip limit	Predicted Discards - 500 lbs trip limit	Predicted Landings - 100 lbs trip limit	Predicted Discards - 100 lbs trip limit	Modeled Landings (Total)	Modeled Discards (Total)	Discards under zero retention option	
GB cod	1,499	2,804	135	1,340	1,634	4,144	6,162	

	Modeled Landings (Total)	Modeled Discards (Total)	Total discards under zero retention option					
CCGOMyt	160	1,311	1,838					

	Predicted Landings May 1 - May 31	Predicted Discards May 1 - May 31	Predicted Landings June 1 - Feb 28	Predicted Discards June 1 - Feb 28	Predicted Landings Mar 1 - Apr 30	Predicted Discards Mar 1 - Apr 30	Modeled Landings (Total)	Modeled Discards (Total)
SNEyt	12	182	404	180	53	87	469	449

Table 118 - Estimated landings and discards for stocks anticipated to reach the TAC thresholds (70 or 90%) under rebuilding alternative 2 input controls and the phased reduction rebuilding program.

Summary

This alternative is likely to increase total discard mortality relative to other options, due mostly to the trip limits imposed on GB cod, CCGOM yellowtail and SNE/MA yellowtail . Factoring in allowances for the raised footrope and haddock separator trawls mitigated the discard rates somewhat, but discards still exceed landings by margins ranging from 2:1 to 13:1. If retention of species is prohibited once a TAC is achieved, analysis shows that those discard to landing ratios may reach as high as 160:1.

5.2.8.4.5 Alternative 3 – Area Management

This alternative was not selected. This alternative adopts most of the measures use in Alternative 2, with the exception of a DAS reduction. In addition, it may result in measures designed for specific areas in the future. Species-specific TACs are assigned to each of these areas, with various options for restricting the fishery in an area as a TAC is reached.

Summary
Compared to the no action alternative, Alternative 4 should result in reduced discards as a result of changes in gear requirements. The application of species-specific TACs in areas, if they can be set at appropriate levels, should also serve to reduce discards. One difficulty in setting these TACs at the appropriate levels is that there is limited information on discards by area. This alternative is not likely to reduce overall discards as much as Alternatives 1 through 4 because effort is not controlled to the same extent as in those options. Future changes to measures in a specific area will need to be evaluated as to their impacts on bycatch when they are proposed.

5.2.8.4.6 Alternative 4 - "Hard" Total Allowable Catch

This alternative was not selected. This alternative would have established TACs for all groundfish stocks. Management measures in place August 1, 2002 (see Appendix XV) will continue until changed in the future. These measures are the same as those in Alternative 2 with the exception of the 65 percent DAS reduction. The bycatch implications of those measures are described in section and are not repeated here. In general, the effort controls and gear changes should reduce bycatch compared to the no action alternative.

The implications of TACs are discussed in section 5.2.8.4.5. If correctly designed to take into account incidental catches, a TAC should not result in an increase in bycatch. If the TAC is not set correctly, however, it may force discards of one stock while fishing continues on another stock. As discussed in other sections, for some stocks there is limited information on current bycatch levels. This will make it difficult to set TAC levels appropriately. The application of a TAC is likely to increase bycatch until additional information is collected that precisely estimates discards in the fishery.

5.2.8.4.7 Alternative 4 - "Hard" Total Allowable Catch

This alternative establishes TACs for all groundfish stocks. Effort controls in place August 1, 2002 (see Appendix XV) could continue until changed in the future, or the TAC may be combined with rebuilding Alternative 2 or the measures in place in FY 2001. The bycatch implications of the Alternative 2 measures are described in section 5.2.8.4.4, and the bycatch implications of the August 1, 2002 measures are described in section 5.2.8.4.3; neither discussion is repeated here. In general, the effort controls and gear changes should reduce bycatch compared to the no action alternative.

The biological implications of hard TACs are discussed in section 5.2.6.6. TACs estimated based on the Phased-F and F-Rebuild rebuilding schedules (chosen as upper and lower bounds for their short-term impacts on landings) are lower than predicted FY04 landings for seven out of 17 stocks (Table 119). This alternative calls for stock-based trip limits to take effect at the time "threshold" somewhere between 70 and 90 percent of the TAC is caught. The intention of this threshold is to shift fishing pressure off affected stocks while still maintaining the ability to fish for other species in the same areas. Trip limits, in this regard, are intended to minimize discards of incidental catch.

Stock	Predicted FY04 Landings – Status Quo	04 estimated TAC, F_Rebuild	04 estimated TAC, Phased_F
GOM cod	5,956	2,663	3,732
GB cod	8,680	2,747	5,920
white hake	3,961	3,199	3,199
SNE winter fl	3,890	2,239	3,011
CCGOM yellowtail	2,898	235	1,482
SNE/MA yellowtail fl	2,765	645	1,664
Am. plaice	4,892	2,311	3,391
GOM haddock	1,235	3,688	3,688
GB haddock	9,293	9,596	8,636
pollock	4,608	10,170	10,170
redfish	601	1,615	1,615
GOM winter fl	682	3,403	3,403
GB winter fl	2,102	3,000	3,000
S windowpane	73	215	215
N windowpane	52	309	309
GB yellowtail fl	3,820	5,832	5,532
witch fl	3,409	5,499	5,499

Table 119 – Predicted FY04 landings (under Status Quo) and TACs estimated based on the F-Rebuild and Phased-F rebuilding schedules.

The trip-limit model discussed in Section 5.2.6.6 indicates that trip limits will be instituted very early in the fishing year, allowing for lengthy periods of fishing under trip limits and the potential for heavy discards. Table 120 and Table 121 show high portions of the remaining TAC (after trip limits take effect at either the 70 or 90 percent threshold) being discarded. The trip limit model assumes that fishing behavior does not change based on TACs (trips are either profitable, in which case they discard, or they are not profitable, in which case they are assumed to not occur) and therefore is likely to overestimate discards providing fisherman elect to fish in other areas once trip limits take effect. Similarly, the trip limit model does not account for trips occurring under simultaneous TACs, which would presumably make more trips unprofitable and shifting effort to other stocks or regions. However, the results of the trip limit model indicate that it is very often profitable to continue fishing in areas where high discards of stocks under a trip limit are likely.

GOM haddock, GB haddock, Pollock, redfish, GOM winter flounder, GB winter flounder, northern and southern windowpane flounder, GB yellowtail flounder and witch flounder are not predicted to reach the TAC threshold.

		70% Threshold				90% Threshold			
F_Rebuild	Stock	Predicted Landings under trip limits	Predicted Discards under trip limits	Modeled Landings (Total)	Discards under zero retention option	Predicted Landings under trip limits	Predicted Discards under trip limits	Modeled Landings (Total)	Discards under zero retention option
	GOM cod	247	552	2,111	1,610	22	244	2,419	1,561
	GB cod	62	761	1,985	6,393	9	260	2,481	5,710
	white hake	517	443	2,757	690	192	126	3,072	374
	SNE winter fl	66	596	1,634	1,526	8	216	2,023	1,204
	CCGOM yellowtail	0	0	386	1,919	0	0	386	1,919
	SNE/MA yellowtail fl	0	0	668	312	0	0	668	312
	Am. plaice	144	547	1,762	2,092	24	207	2,104	2,079

Table 120 - Estimated landings and discards (after trip limits take effect and total) for seven impacted species; annual TACs based on F-Rebuild rebuilding strategy; trip limits based on FY 2002 effort control measures. Catch in metric tons.

		70% Threshold				90% Threshold			
Phased_F	Stock	Predicted Landings under trip limits	Predicted Discards under trip limits	Modeled Landings (Total)	Discards under zero retention option	Predicted Landings under trip limits	Predicted Discards under trip limits	Modeled Landings (Total)	Discards under zero retention option
	GOM cod	585	534	3,198	1,132	118	255	3,477	1,025
	GB cod	507	1,267	4,651	3,804	99	492	5,427	3,294
	white hake	517	443	2,757	690	192	126	3,072	374
	SNE winter fl	234	669	2,342	941	58	243	2,768	602
	CCGOM yellowtail	89	346	1,127	1,057	13	131	1,347	998
	SNE/MA yellowtail fl	204	257	1,369	257	35	130	1,532	257
	Am. plaice	474	542	2,847	1,130	120	219	3,171	938

Table 121 - Estimated landings and discards (after trip limits take effect and total) for seven impacted species; annual TACs based on Phased-F rebuilding strategy; trip limits based on FY 2002 effort control measures. Catch in metric tons.

		70% Threshold				90% Threshold			
F_Rebuild	**Stock**	**Predicted Landings under trip limits**	**Predicted Discards under trip limits**	**Modeled Landings**	**Total discards under zero retention option**	**Predicted Landings under trip limits**	**Predicted Discards under trip limits**	**Modeled Landings**	**Total discards under zero retention option**
	GOM cod	247	552	2,111	1,610	8	258	2,405	1,622
	GB cod	62	761	1,985	6,393	5	264	2,477	5,734
	white hake	517	443	2,757	690	31	286	2,911	850
	SNE winter fl	66	596	1,634	1,526	4	220	2,019	1,236
	CCGOM yellowtail	0	0	386	1,919	0	0	386	1,919
	SNE/MA yellowtail fl	0	0	668	312	0	0	668	312
	Am. plaice	144	547	1,762	2,092	10	221	2,090	2,202

Table 122 - Estimated landings and discards (after trip limits take effect and total) for seven impacted species; annual TACs based on Phased-F rebuilding strategy; trip limits based on FY 2001 effort control measures. Catch in metric tons.

		70% Threshold				90% Threshold			
Phased_F	**Stock**	**Predicted Landings under trip limits**	**Predicted Discards under trip limits**	**Modeled Landings**	**Total discards under zero retention option**	**Predicted Landings under trip limits**	**Predicted Discards under trip limits**	**Modeled Landings**	**Total discards under zero retention option**
	GOM cod	242	877	2,855	1,384	27	346	3,386	1,178
	GB cod	217	1,557	4,361	4,371	25	567	5,353	3,308
	white hake	198	760	2,438	1,204	31	286	2,911	850
	SNE winter fl	111	790	2,219	1,057	17	283	2,727	691
	CCGOM yellowtail	52	381	1,090	1,165	6	137	1,340	1,073
	SNE/MA yellowtail fl	132	294	1,297	294	21	146	1,518	271
	Am. plaice	184	832	2,558	1,705	22	316	3,074	1,416

Table 123 – Estimated landings and discards (after trip limits take effect and total) for seven impacted species; annual TACs based on Phased-F rebuilding strategy; trip limits based on FY 2001 effort control measures. Catch in metric tons.

Analysis shows additional regulatory discards falling in a range between 20 and 35% of total (unrestricted and trip limit limited combined) landings assuming that fishing areas close once the TAC is reached. If the areas remain open under the zero-retention option, predicted total regulatory discards approach total landings and, in the case of GB Cod under F-Rebuild, discards exceed landings by a factor of three.

Discards under the TAC-based trip limits tend to exceed landings by a wide margin in most cases, and exceed 50% of trip limit limited landings in all cases.

5.2.8.5 Measures to Minimize the Adverse Effects of Fishing on Habitat

The measures proposed to minimize adverse effects of fishing on habitat include areas closed to protect habitat, changes to the gear allowed into closed areas, restrictions on the use of rock hopper and roller gear, and a requirement for all vessels to have VMS. The only measures that may have impacts on bycatch are the habitat area closures and the restrictions on rock hopper and roller gear.

5.2.8.5.1 Habitat Area Closures

Section 4.1.6.2 includes eight alternatives for closing areas to protect habitat. Area closures, for any reason, may have impacts on bycatch. If the area closed is an area of high catch rates for a species with a trip limit or that has little economic value, the closure may reduce regulatory or economic discards and thus lower bycatch mortality. If the areas shifts effort into higher catch rate areas, the reverse may occur. The proposed habitat closures are not specifically designed to reduce catches, but may have that impact. The analysis of the habitat closures (see section 5.3.8.3.2) ranks the closures on the basis of five criteria:

- by total area protected (nm^2),
- percent of each sediment type protected,
- percent of each species' EFH protected,
- percent of species' aggregations protected based on distribution (biomass protected),
- percent of species' guilds protected based on the food they eat.

Specific information is not available on how each area alternative will affect bycatch. It is likely, however, that impacts on bycatch will be related to the amount of area protected and the percent of species aggregations protected. Alternatives that protect more area and more of a species aggregation are likely to result in greater reductions in bycatch. The relative ranking of each of the habitat alternatives is in section 3.7. Generally, habitat area alternatives 5a and 5c may provide the greatest bycatch reduction, but any of the alternatives should also reduce bycatch.

5.2.8.5.2 Rockhopper and Roller Gear Restrictions

Restrictions on the use of rockhopper and roller gear may change the area that can be trawled. This could affect catch rates. It is not clear whether this measures will reduce or increase bycatch. There is limited information available on the type of gear currently being used, so the impact of the restrictions cannot be determined. In addition, it is not clear how vessels will respond to the restrictions. For example, they may move into areas that have a greater abundance of fish with no economic value, resulting in increased discards of those species, or they may move into areas with less of an abundance or the target species that is managed through a trip limit, reducing discards of that species. The implications of this measure on bycatch are uncertain and cannot be described, even in a qualitative fashion.

5.2.8.6 Other Issues

5.2.8.6.1 Northern Shrimp Fishery Exemption Area

The Council is proposing to remove the area restriction for the Northern Shrimp Fishery Exemption Area. Approval of this measure may increase discards of groundfish and silver hake, particularly if it results in increase effort in the shrimp fishery. An experiment conducted by the State of Maine (see Appendix XIV) determined that the bycatch of groundfish in this fishery is less than the 5 percent standard typically used as a criteria for exempted fishery approval (a standard that may be changed in the future if an alternative in this amendment is adopted). During the experiment, the catch of silver hake far exceeded the catch of any other species - over 72,000 pounds of silver hake were caught compared to less than 2,000 pounds of shrimp and about 1,700 pounds of regulated groundfish. Current regulations limit shrimp fishermen to landing silver hake in an amount equal to the catch of shrimp, which means in this instance that nearly 70,000 pounds of silver hake were discarded. The argument is made that shrimp fishermen will avoid high concentrations of silver hake because of the lack of a market and the physical damage caused to the higher valued shrimp catch. Absent the large silver hake catch, however, the experiment would not have demonstrated that the catch of regulated groundfish is less than 5 percent. In fact, if the silver hake catch was equal to the shrimp catch, the bycatch of regulated groundfish in this experiment would have been roughly twenty percent of the catch. One interpretation of the experiment is that the 5 percent standard will only be met if the fishery catches more silver hake than can be retained, though higher concentrations of shrimp could also result in meeting the bycatch standard. The discards of silver hake that may result can be easily prevented by increasing the amount that can be landed by shrimp fishermen.

The expansion of the shrimp fishery into deeper water may also change the composition of bycatch in this fishery. In the Maine experiment, one-fourth of the regulated species discards were redfish. Plaice and witch flounder were the other primary regulated species caught. Because of the limited time and area of the experiment, it is not possible to accurately determine the overall impacts of this measure. Expanding the area for the fishery is likely to increase overall bycatch.

5.2.8.6.2 Tuna Purse Seine Vessel Access to Groundfish Closed Areas

Two alternatives were considered for allowing tuna purse seine vessels access into groundfish closed areas. The tuna purse seine fishery is managed on an individual quota basis. Vessels fish until the quota is reached. The alternatives do not change the amount of effort that will be in the fishery, but do increase the area eligible. Since tuna purse seine fishing is a mid-water gear for highly mobile pelagic species, it is unlikely that the proposed action will have any impacts on bycatch, unless the concentrations of fish are so different in the areas that will be open.

5.2.8.6.3 SNE General Category Scallop Vessel Exemption Program

The proposed action will allow fishing by general category scallop fishing vessels in an area in the SNE Regulated Mesh Area. The proposal implements a requirement that these vessels use an eight-inch twine top, which has repeatedly demonstrated that it reduces groundfish bycatch in scallop dredges. This requirement is a specifically designed to reduce groundfish bycatch in this fishery to the minimum that is practicable. This measure may increase bycatch of both regulated groundfish and skates, but the impacts are expected to be minimal due to the use of the large mesh twine top.

5.2.8.7 Summary

This amendment proposes many management measures that will affect bycatch. A general overview of techniques available to reduce bycatch is provided in Alverson (1998). While generally complete, the list does not include reductions in effort as a means to reduce total discard mortality. Effort reductions are similar to decreased quotas for target species in that if correctly designed and implemented they reduce the total catch.

- International legislation of suitable gears and areas (not applicable to domestic management of the groundfish fishery)
- Time and area closures
- Establishment of discard quotas
- Use of new technology and operational modes (gear modifications, restrictions on operation, etc.)
- Full use strategies
- Establishment of authorized discard rates
- Marine parks
- Incorporation of bycatch into catch quotas
- Prohibition on retention
- Incentive-based programs
- Decreased quotas for target species

Many of these bycatch reductions strategies are incorporated into the alternatives under consideration. The following table summarizes the strategies used in the major alternatives under consideration (Table 124).

Bycatch Reduction Strategy	Fishery Program Administration	Alt. to Control Capacity	Mortality Reduction Alternatives					Northern Shrimp Fishery	Tuna Purse Seine Vessel Access to Closed Areas	SNE General Category Scallop Exemption Program
			Proposed Action	Alt. 1	Alt. 2	Alt. 3	Alt. 4			
International legislation of suitable gears and areas										
Time and area closures	X		X	X	X	X	X			X
Discard quotas			X				X			
Use of new technology and operational modes	X		X	X	X	X	X	X		X
Full use strategies										
Establishment of authorized discard rates										
Marine parks										
Incorporation of bycatch into quotas						X	X			
Prohibition on retention							X	X	X	
Incentive-based programs	X		X		X	X				
Decreased quotas for target species			X		X	X	X			
Decreased effort		X	X	X	X	X	X			

Table 124 - Summary of bycatch reduction strategies used in proposed alternatives

5.2.9 Impacts on Protected Species

The impacts of the existing Multispecies fishery to endangered and threatened whales, sea turtles, and fish has been discussed in the existing biological opinion and further Section 7 consultation actions conducted by NMFS. In addition, the EIS and EA documents prepared for each Multispecies fishery management action have addressed the impacts of existing fishery actions on other protected species, namely marine mammals. The conclusions contained in these documents describe the current baseline assessment of impacts to protected species from Multispecies fishing activities and are summarized below and at the end of this section.

Many of the factors that serve to mitigate the impacts of the multispecies fishery on protected species are currently being implemented in the Northeast Region under either the Atlantic Large Whale Take Reduction Plan (ALWTRP) or the Harbor Porpoise Take Reduction Plan (HPTRP). In addition, the Multispecies FMP has undergone repeated consultation pursuant to Section 7 of the Endangered Species Act (ESA), with the most recent Biological Opinion dated June 14, 2001. The conclusion in that Opinion states that the multispecies fishery is likely to jeopardize the continued existence of the North Atlantic right whale, and required NMFS to implement a set of Reasonable and Prudent Alternatives (RPAs) to remedy the jeopardy finding. As described below, the regulatory measures of the ALWTRP and the HPTRP have been implemented in direct response to the ESA and MMPA concerns expressed regarding the fishing operations taking place under the Multispecies FMP (and others) and must be adhered to by any vessel fishing for multispecies.

We recognize that measures contained in the Multispecies FMP could change at any time, potentially changing the degree of protection afforded all marine mammals as well as species listed as threatened or endangered under the ESA. However, once an FMP is in place, most changes to its measures occur through further Council action that require NEPA documents, and would be reviewed by NMFS for possible re-initiation under the ESA.

Atlantic Large Whale Take Reduction Plan

The ALWTRP contains a series of regulatory measures designed to reduce the likelihood of fishing gear entanglements of certain large whale species in the North Atlantic namely the right, humpback, fin, and minke whales. The RPA's called for three key regulatory changes: 1) new gear modifications; 2) implementation of a Dynamic Area Management system (DAM) of short-term closures to protect unexpected concentrations of right whales in the Gulf of Maine; and 3) establishment of a Seasonal Area Management system (SAM) of additional gear modifications to protect known seasonal concentrations of right whales in the southern Gulf of Maine and Georges Bank. All of the above changes have now been implemented. In addition, regular meetings are held to seek improvements to the ALWTRP, and additional measures are being discussed for further action.

Harbor Porpoise Take Reduction Plan

The gear used to catch multispecies includes sink gillnet gear that has been found to entangle and kill harbor porpoise. The HPTRP was developed to reduce the impact of this gear type on harbor porpoise populations to acceptable levels as defined under the MMPA. The measures implemented under the HPTRP include time/area closures combined with the use of acoustical devices (pingers) on nets. These measures have been shown to be effective in reducing the serious injury and mortality of harbor porpoise in the sink gillnet fishery as shown in the table below.

	Northeast Sink Gillnet	Mid-Atlantic Coastal Gillnet	TOTAL
1994-1998 Average	1163	358	1521
1999	270	53	323
2000	507	21	529
2001	51	26	80

Table 125 – Harbor Porpoise Takes in Gillnet Fisheries 1994 - 2002
1999, 2000, 2001 represent the years since implementation of the HPTRP.
Data from NMFS as published in the FEDERAL REGISTER on August 7, 2002.

5.2.9.1 Protected Species Summary

The following paragraphs contain summaries of the impacts of fishing activities conducted under the Multispecies FMP to protected species. Detailed information regarding the impacts described herein can be found in Section 9.2.2 and in the discussion of the impacts of the specific Amendment 13 alternatives in the sections that follow.

Right Whale
Given the known anthropogenic sources of right whale mortality, their low population size, and their poor reproductive rate, the loss of even one northern right whale because of gear operating in the multispecies fishery may reduce appreciably the likelihood of both survival and recovery of this species. Although there have been some large whale interactions with trawl gear in Alaska, there are no documented takes of large whales in New England bottom trawl gear. However, right whale interactions with sink gillnet gear are more common (See Table 111 below). Documented entanglements in any fishery are considered an underestimate of the extent of the entanglement problem since not all entanglements are likely to be observed. Consequently, although the total level of interaction between fisheries and right whales is unknown, recent studies have estimated that over 60% of right whales exhibit scars consistent with fishery interactions.

New gear modifications required by the ALWTRP regulations are designed to further reduce the amount of serious injury and mortality from an encounter, but do not eliminate the threat of entanglement. The recent implementation of the DAM system and SAM program described above, will further separate multispecies gear from most known or predicted right whale concentrations, but cannot be expected to be 100% effective. Therefore, fisheries that utilize sink gillnet gear (including the multispecies fishery) will continue to pose a risk of entanglement to right whales.

The bulk of the measures to be implemented under Amendment 13 are designed to achieve specific fishing mortality reductions for cod, haddock and yellowtail flounder. The tools selected by the Council include effort reduction in all components of the fleet through DAS restrictions and closed areas. These measures are likely to reduce fishing effort across all gear types, including sink gillnet gear. However, due to the ability of gillnet vessels to shift to non-multispecies target species, the effort reduction is not likely to achieve the same percentage anticipated in the multispecies fisheries. Regardless, Amendment 13 will reduce by some degree the existing adverse impacts of multispecies fishing activities to all large whales including the right whale.

The Council is confident that the impacts to right whales will continue to be assessed under the ALWTRP process, as well as the FMP process. Further, any modifications required to further relieve adverse effects will be applied to both the multispecies fisheries, (through framework actions and other future management measures) as well as other fisheries that are known to interact with right whales.

Humpback, Fin, and Minke Whales

Humpback, fin, and minke whales are taken in the sink gillnet fisheries that catch many commercially sought species, including multispecies (see Table 126 below). The humpback and fin whales are listed as endangered under the ESA. The minke whale, although not protected under the ESA, is protected under the MMPA and is one of the species that the provisions of the ALWTRP are designed to protect. As with the right whale, the impacts of these fisheries on the humpback and fin whales have been assessed in ESA consultations for the Multispecies FMP as well as other FMPs that interact with these species. The Opinion concluded that the fisheries would not jeopardize the endangered humpback and fin whale. The Environmental Assessment for the ALWTRP determined that the ability of the minke whale populations to maintain optimum levels would not be compromised by the existing Multispecies and ALWTRP measures. The ALWTRP measures, recently revised to meet the RPAs established to protect the right whale, are expected to further reduce the potential for mortality and serious injuries that are occurring in all large whale populations in the Northeast Region.

SPECIES	Right		Humpback		Fin		Minke		TOTAL	
	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive
1997										
Gillnet	0	1	0	0	0	2	0	0	0	3
Pot/Trap	0	2	0	1	0	1	0	2	0	6
UNK/Other	0	1	0	1	0	0	0	0	0	2
TOTAL	0	4	0	2	0	3	0	2	0	11
1998										
Gillnet	0	0	1	4	0	0	1	0	2	4
Pot/Trap	0	2	0	1	0	0	0	0	0	3
UNK/Other	0	1	0	0	0	0	0	1	0	2
TOTAL	0	3	1	5	0	0	1	1	2	9
1999										
Gillnet	1	0	0	2	0	0	0	0	1	2
Pot/Trap	0	2	0	1	0	1	0	1	0	5
UNK/Other	0	1	0	1	0	0	2	0	2	2
TOTAL	1	3	0	4	0	1	2	1	3	9
2000										
Gillnet	0	0	0	2	0	0	0	0	0	2
Pot/Trap	0	0	0	0	0	0	0	2	0	2
UNK/Other	0	2	0	1	0	0	0	0	0	3
TOTAL	0	2	0	3	0	0	0	2	0	7
2001										
Gillnet	0	0	1	1	0	0	0	0	1	1
Pot/Trap	0	1	0	1	0	0	0	0	0	2
UNK/Other	1	1	0	1	0	0	0	0	1	2
TOTAL	1	2	1	3	0	0	0	0	2	5
Total All	2	14	2	17	0	4	3	6	7	41

Table 126 – Large Whale Entanglements 1997 – 2001*

* Data from NMFS entanglement reports where some gear was recovered and/or observed allowing experts to attempt to ID gear. Other entanglement records exist but gear was not recovered or observed.

The measures selected by the Council include effort reduction through DAS restrictions and closed areas that will affect all components of the fleet, including the sink gillnet component. As stated above, Amendment 13 will reduce by some degree the existing adverse impacts of multispecies fishing activities to all large whales including the humpback, fin and minke whales.

Blue, Sei, and Sperm Whales

The limited surveys that were conducted in the Northeast Region (CeTAP surveys in 1979-81, and NMFS summer ship and aerial surveys conducted from 1990-98) did not record significant sightings of blue whales over shelf waters. Sei whales are seen more commonly along the northern and eastern flanks of Georges Bank, and are observed occasionally in near shore shelf waters as well. The known feeding behavior of blue and Sei whales suggest they focus on plankton/zooplankton resources that are found in the upper water column. Sperm whales are frequently found foraging along the shelf edge at the outer edge of the known multispecies fishing areas and forage in the deeper waters where trawl gear does not operate.

Although the sink gillnet gear operations that catch multispecies may affect the blue, sei, and sperm whales, there appears to be significant separation between the known feeding range of these species and the primary multispecies fishing areas. This is borne out by the marine mammal stock assessment report statements that the level of interaction for these species is insignificant and approaching a zero mortality and serious injury rate (Waring et al. 2001). As stated above, Amendment 13 will reduce by some degree the existing adverse impacts of multispecies fishing activities to all large whales including the blue, sei, and sperm whales. Therefore, the gear used in the multispecies fishery is not likely to adversely affect the blue, sei, or sperm whales.

Other Marine Mammals

Several other marine mammal species (such as seals, dolphins, and small whales) are known to frequent the continental shelf regions where multispecies fisheries activities occur. Although it is unlikely that the bottom-tending trawl gear used by the bulk of the multispecies vessels will affect these species, interactions with the sink gillnet component of the fishery are well documented. Assessments of the impacts of fishing activities on these species can be found in the annual marine mammal stock assessment reports published by NMFS (Waring et al. 2001) and are described further in Section 9.2.2. Interactions between sink gillnet gear used in the multispecies fishery and these marine mammal species are not expected to increase under the Amendment 13 measures due to the general decrease in fishing effort expected as a result of these measures.

Sea Turtles

Multispecies fishing effort is concentrated primarily in the Gulf of Maine and Georges Bank areas. Sea turtle distribution in the Northeast Region is focused along the Mid-Atlantic and Southern New England shelf region during the summer and early fall. Therefore, with the exception of cold-tolerant leatherbacks that are able to forage into the middle of the Gulf of Maine, the overlap between the multispecies fishery and sea turtles does not appear to be great.

The multispecies gears most likely to affect sea turtles are otter trawls and sink gillnets. NMFS assessed the potential impact of these two gear types on all sea turtle species in the Biological Opinion issued for the Multispecies FMP and concluded that the takes would not jeopardize the continued existence of the ridley, green, leatherback, or loggerhead sea turtles. As stated above, Amendment 13 to the Multispecies FMP will decrease the overall effort for trawl and gillnet gear. Therefore, the potential impacts to sea turtles will not increase with its implementation, and are likely to decrease.

Fish
The existing multispecies fisheries activities were determined to have no affect on the endangered shortnose sturgeon and Atlantic salmon. The new measures imposed under Amendment 13 will not change the basis for this determination.

The barndoor skate is a candidate species that is often caught as a bycatch species in the offshore trawl and sink gillnet fisheries that target multispecies. Possession of barndoor skate has been prohibited under the Skate FMP. In addition, the bulk of the measures to be implemented under Amendment 13 are designed to achieve specific fishing mortality reductions for cod, haddock and yellowtail flounder. The tools selected by the Council include effort reduction in all components of the fleet through DAS restrictions and closed areas. Many of these measures are likely to reduce the bycatch of barndoor skate as well. Therefore, barndoor skate should not be further depleted by management actions taken under the Amendment 13.

Right Whale Critical Habitat
NMFS evaluated the potential effects of the multispecies fisheries on the two critical habitats that have been designated in the Great South Channel and Cape Cod Bay in a Biological Opinion issued on June 14, 2001. NMFS evaluated the potential effects of the proposed fisheries operations on both prey availability and quality and nursery protection in the critical habitat. There was concern that the operation of these fisheries could diminish the value of the habitat by altering trophic dynamics that could reduce the availability of right whale prey within the critical habitat areas. However, right whales feed primarily on copepods that live in the mid-water zone, making it highly unlikely that bottom-tending multispecies gear will have any adverse effect on microscopic copepods believed to be unaffected by the use of gear that catch larger fish such as multispecies. Amendment 13 does not change the way in which the fishing gear will operate. Therefore, the Council does not believe the multispecies fishery, as operated under Amendment 13, will affect right whale critical habitat.

Impacts of the Amendment 13 Alternatives
The basic goals of the proposed Amendment 13 to the Multispecies FMP are to achieve specific fishing mortality reductions for cod, haddock and yellowtail flounder, and to bring the FMP into compliance with the recent court order. The alternatives that were considered by the Council for the Amendment 13 are described in Section 3 of this document. Provided below are assessments of the relative impacts of both the selected an non-selected measures on the protected species described in Section 9.2.2 of this document.

5.2.9.2 Fishery Administration

Fishing Year
The fishing year options that were considered are; May 1 – April 30 (Status Quo – Selected), January 1 – December 31, October 1 – September 30, and July 1 – June 30.

Protected species benefits occur when the beginning of the fishing year does not start during a high use period for large whales and small odontocetes, thus avoiding the surge of effort that often occurs at the beginning of a season. The No Action starting date of May 1 occurs during the spring migration of large whales and small odontocetes such as harbor porpoise into the Gulf of Maine. Compared to May 1, the July 1 – June 30 fishing year would have been the best option for protected species, followed by October 1 – September 30, and then January 1 – December 31.

DAS Pro-Ration (Not Selected)
Since DAS are based on the fishing year, a system was proposed to prorate DAS to accommodate for any change in fishing year. Three options were offered. Option 1 is a straightforward pro-ration scheme that could result in a short-term increase in DAS. Option 2 would cap any increase in DAS during the first year, and Option 3 would delay any change to the next fishing year. Depending on at what point in the calendar year the increase described in Option 1 would have occurred, it may have been less beneficial to protected species than the other two options. Option 2 would have been favored over Option 3 as the increased DAS would have been capped and not just deferred to the next year. There was no need for a DAS pro-ration scheme under the selected No Action alternative.

Periodic Adjustment Process (Selected)
Several alternative processes for periodic adjustment of the Multispecies FMP measures were proposed. These alternatives are administrative in nature and have little effect to protected species. In addition, protected species impacts are assessed independently on a regular basis under the NEPA and the ESA. Therefore, protected species impacts are not changed by the adjustment process used for FMP measures.

United States/Canada Resource Sharing Understanding (Selected)
This alternative will set up a comprehensive program by which transboundary stocks would be co-managed by the two countries. The program involves entry requirements for vessels, observer and VMS requirements, as well as significant reporting requirements designed to provide adequate management controls. Special TACs will be established with appropriate gear and other harvesting controls implemented to assure adherence to TACs.

The transboundary stocks are generally found on the eastern edges of Georges Bank or along the Hague Line in the center of the Gulf of Maine. Large whales and small odontocetes such as harbor porpoise are found in these areas during certain specific seasons.

Although this alternative is administrative in nature, the means by which the specific requirements of the ALWTRP and HPTRP are incorporated into the program is not addressed in this alternative. This is important both in terms of applicability to Canadian participants that are fishing in US waters as well as US vessels in Canadian waters. There is no U.S./ Canada resource sharing agreement for transboundary stocks under the No Action alternative, thus any attempt at international management of these stocks, and the associated incorporation of protected species protection measures on an international basis would be a benefit to transboundary protected species such as large whales and harbor porpoise.

Administration of Certified Bycatch/Exempted Fisheries (Selected)
This alternative is administrative in nature and has little effect to protected species. An assessment of the effects of an exempted fishery on protected species in closed areas would be conducted prior to approval of the exempted fishery. Therefore, administration of the exempted fishery program will always involve its own protected assessment process.

Special Access Programs (Selected)
This alternative will establish a Special Access Program (SAP) that would allow access to certain fish stocks that are partially rebuilt. The SAPs will define the how participants may utilize the Category B – DAS under the selected rebuilding alternative. Incentives would also be offered to vessels using gear or techniques that avoid or significantly reduce the catch of stocks of concern. Stocks that may be considered for this program include those whose previous year's catch fell short of the target or hard TAC. SAPs must be approved by either Framework or Amendment action. Therefore, each SAP will undergo complete protected species review before it can be approved.

SAPs are not available under the No Action alternative, thus any additional fishing effort that may result under the No Action alternative must be implemented by either a framework action, further amendment, or under an exempted fishery. Each of these actions requires individual protected species assessment. Therefore, in regard to protected species, the SAP process is identical to the No Action alternative.

The following SAPs are included in the Amendment 13 document.

Georges Bank Yellowtail Flounder Special Access Program (Selected)
During June through December, fishing vessels may make two trips per month into a portion of Closed Area 2 that was opened for scallops in order to fish for yellowtail flounder (30,000 lb trip limit). This option is expected to involve 320 trips.

This option will not affect protected species, as Closed Area 2 is not a high use area for either marine mammal or sea turtle species.

Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program (Selected)
Vessels fishing for fluke west of 72-30W would be allowed to retain and land up to 200 lbs of winter flounder.

The fluke fishery generally occurs in the early spring months before sea turtles move into the Southern New England/Mid-Atlantic region thus limiting the potential effect to those species.

US/CA Resource Sharing Understanding SAP (Selected)
Limitations will be place on the number of trips vessels may take into the US/CA area. Further, vessels participating in this SAP will not be charged for DAS for steaming time.

Large whales and small odontocetes such as harbor porpoise are found in these areas during certain specific seasons. Vessels utilizing this SAP are likely to be transferring their fishing effort from an area of higher use by large whales and harbor porpoise. Thus the net impact to these species may be less.

Hook Gear Closed Area I SAP (Selected)
Vessels using hook gear may participate in a program to access haddock in Closed Area I. Closed Area I is not available to any multispecies permit holder under the No Action alternative. Hook vessels would be limited to a maximum of 3,600 hooks to be used from September 16 to December 31, and must have observers on all trips.

Hook gear used in Closed Area I in the fall is generally not a serious threat to the large whale species that frequent Closed Area I in the spring. However, the presence of any fixed gear in this area may be problematic to these species.

Sea turtles and seals are not known to frequent Closed Area I. Small odontocetes are known to become entangled in gillnet gear, although the Closed Area I region is not a high use area for those species. In any case, the complete closure of Closed Area I under No Action alternative is more protective for protected species.

Gillnet Gear Closed Area I SAP (Not selected)
Vessels using gillnet gear could have participated in a program to access haddock in Closed Area I. Closed Area I is not available to any multispecies permit holder under the No Action alternative. Gillnet vessels would have been limited to 50 gillnets to be used from July 1 through March 31. Observers would have been required on all trips, and vessels would have been equipped with a VMS.

Much of Closed Area I is closed to gillnet gear from April 1 to June 30 under the ALWTRP. The timing of this SAP would have avoided the spring large whale concentrations in Closed Area I. This would have protected the large whales during the critical spring period. Although gillnet gear is a problem for large whales throughout their summer foraging range, allowing gillnet gear into the area during late summer through winter might have actually moved the gear away from more highly utilized areas in the GOM.

Sea turtles and seals do not frequent Closed Area I. Small odontocetes are known to become entangled in gillnet gear, although the Closed Area I region is not a high use area for those species in the summer and fall. In any case, the complete closure of Closed Area I under No Action alternative would have been more protective for protected species.

Closed Areas Administration (Not Selected)
Year round closed areas have been established for a variety of reasons over an extended period. The No Action alternative does not allow exempted fisheries to operate in the year-round closed areas. This option would provide a detailed rationale for existing closed areas and would review the issue of access to those areas. Five options were considered. No specific option was selected, however, the intent, specific purpose, duration, and who can or cannot fish in a closed area will be part of the decision process for future closure and/or closure access discussions.

Option 1 – All Exempted Fisheries are Allowed in a Closed Area
Closed Area 1 is part of Right Whale Critical Habitat that is closed to sink gillnet gear from April 1 to June 30 under the SAM provisions of the ALWTRP. Allowing exempted fisheries utilizing sink gillnet gear in that area during the spring migration period could have been a problem for large whales. However, as mentioned above, each exempted fishery undergoes its own review under the ESA and NEPA. Any large whale or other protected species issue will be handled at that time.

Option 2 – Certain Exempted Fisheries Allowed in Closed areas 1 & 2
See the response above. Large whales would have been subject to potential threats if gillnet and pot/trap gear were allowed in Closed Area 1 at certain times. However, a separate ESA consultation and NEPA review would have addressed these concerns.

Option 3 – Certain Exempted Fisheries Allowed in the Nantucket Lightship Closed Area
Since the Nantucket Lightship Closed Area is not a high use area for protected species, no adverse effect on protected species was anticipated. However, as mentioned above, a separate ESA consultation and NEPA review is conducted when any exempted fishery is being considered. Any new information regarding possible protected species concerns will be addressed at that time.

Option 4 – Certain Exempted Fisheries Allowed in the Western GOM
The western GOM is a seasonal high use area for large whales (spring and summer), harbor porpoise (spring and fall), and seals (winter). However, pelagic gillnet gear was the only gear identified under this alternative. Any potential threat to these species would have been assessed at the time of issuance for the exempted fishery.

Option 5 – No Commercial Exempted Fisheries are Allowed
A complete ban on exempted fisheries in closed areas would have been the best situation for protected species, as it would have excluded all commercial fishing gear from closed areas. Since this option was identical to the No Action alternative, no additional effort shifts to avoid a new closure would have occurred.

Flexible Area Action System (Selected)
The FAAS is available under the No Action alternative, but has never been successfully implemented in the Northeast. Therefore, eliminating the FAAS will not change the impacts of Amendment 13 on protected species.

Leasing of DAS (Selected)
This alternative will allow vessels to lease active DAS (Category A) from other vessels, which was not allowed under the No Action alternative.

Leasing DAS represents a consolidation of effort to fewer vessels utilizing the same amount of effort. This could have either a beneficial or adverse impact to protected species with respect to interactions with gillnet gear. If gillnet vessels lease only to gillnet vessels, then there would be less gear in the water, although the remaining gear could be fished longer. This may be beneficial to protected species. However, if trawl vessels are allowed to lease to gillnet vessels it would result in an increase in overall gillnet effort thus raising the probability of interactions with large whales, harbor porpoise, and seals. In addition, increased trawl effort in the southern New England area frequented by sea turtles and small pelagic odontocetes may be a problem for those species.

Recreational Fishing Permit (Not Selected)
No recreational fishing permit is required under the No Action alternative. Although recreational fishing gear is known to interact with protected species, the size and relative low strength of the gear make it unlikely to cause serious injury to whales, dolphins, or sea turtles. Therefore, requiring recreational fishermen to obtain a permit would have had no adverse effect on protected species. Requiring permits would have offered a means of providing education to permit holders on avoiding interactions with protected species.

"Running Clock" Alternatives (Not Selected)
Several "running clock " alternatives were proposed to accommodate overages in daily trip limits and/or DAS that were not a part of the No Action alternative. The method by which DAS and/or trip limits are tallied would not have had a direct effect on protected species as the at sea effort per DAS or trip length will be the same in the long run.

Observer Coverage (Selected)
Two alternatives that would increase observer coverage over what occurs under the No Action alternative were proposed. The Council desires 10 per cent coverage in all gear sectors. Any increase in observer

coverage will be a benefit to protected species, as better data will be collected on protected species bycatch in all gear sectors.

Vessel Monitoring System Requirements (Selected)
A mechanism to allow vessels to drop out of the program for a one-month period was selected under this alternative, as long as the vessel does not participate in any monkfish or groundfish fishery. No such mechanism existed under the No Action alternative. The VMS requirements have no direct or indirect impact on protected species.

Day Gillnet Out of the Fishery (Not Selected)
This alternative would have eliminated the current requirement for day gillnet vessels to be out of the fishery for a 21-day period between June and September. Retaining the 21 days for a day gillnet vessel to be out of the fishery between June and September (Option 1) is a benefit to large whales, harbor porpoise, and small odontocetes, as those months are high use periods for those species and any reduction in gillnet effort would maintain a lower probability of interaction during that period.

DAS Counting (Not Selected)
This alternative contained three options for counting partial DAS. The method by which DAS are counted has no affect on protected species, since effort reduction will remain the same under each option.

Reporting Requirements (Selected)
Three options for linking dealer reports with vessel trip reports were considered in this alternative. The method by which dealers and vessels provide required reports has no effect on protected species, as the data received will remain the same.

Hand Gear-Only Permit Alternatives (Selected)
An open access hand gear permit exists under the No Action alternative. An option to create a second limited access hand gear-only permit was selected to set a 250 hook limit, while allowing 300 pounds of cod to be caught. Open access permits are limited to 75 pounds of cod. Although this gear type is known to interact with protected species, the size and relative low strength of the gear make it unlikely to cause serious injury to the large whales, dolphins, or sea turtles. Therefore, this gear allocation program will not affect protected species.

Sector Allocation Alternatives (Selected)
A sector allocation system will apportion part or all of groundfish fishery resources to various industry sectors. Sectors will be formed voluntarily based on gear used, permit category, vessel size, homeport, area fished, or some other grouping. Vessels not in a sector will remain in a common pool under normal Council management. A detailed sector management plan must be developed and approved by NMFS, following which the Council will impose restrictions to allocate resources and establish fishing mortality controls.

We are unable to assess the protected species impacts of the sector allocation system until each sector plan is developed for approval. However, the following comments can be made on the sector allocation that was discussed in this alternative.

Georges Bank Hook Sector
Participation in this sector will be open to vessels with a history of using jig, demersal longline, open access hand gear, to harvest Georges Bank cod.

Although the hook gear types are known to interact with protected species, they are unlikely to cause serious injury to the large marine mammals or sea turtles. The transfer of multispecies effort from traditional gear types (trawl and gillnet) used under the No Action alternative to hook gear will be an overall benefit to most protected species except seals who may be attracted to the baited hook method.

While the Council considered establishing a gillnet sector, it was not selected. It is not clear whether the gillnet restrictions are individual or cumulative for day and trip boats. If adopted in the future, the cumulative number of 500 nets is high for gillnet vessels and would not be a benefit to large whales, harbor porpoise, and seals over the No Action alternative levels of 80 stand-up nets and 160 tie-down nets. Sea turtles and small pelagic odontocetes do not frequent Georges Bank and thus would be unaffected by this measure.

Gulf of Maine Inshore Conservation and Management Stewardship Plan (Not selected)
Three distinct regulatory areas would have been created in the GOM. Effort was frozen at DAS levels used by each vessel as of August 1, 2002. The Amendment 13 DAS level chosen would have been set for each vessel and the amount left over would have been established as the frozen amount available to each vessel under the rebuilding program. Gillnet gear restrictions were set at 50 nets for all vessels.

The 50 gillnet restriction would have provided benefits for large whales, harbor porpoise, seals, and the cold-tolerant leatherback sea turtle in the GOM, as it was more restrictive than the 80 net restriction under the No Action alternative. The DAS structure would have provided no additional benefit to protected species, although when combined with the gillnet restrictions, it would have assured an overall reduction in gillnet effort in the GOM. This alternative would not have affected other sea turtles or small odontocetes, as they do not frequent the Gulf of Maine.

5.2.9.3 Alternatives To Control Capacity

Alternative 1 - Permit Absorption (Not Selected)
A permit holder could have transferred all permits held to another vessel under this alternative. This alternative also would have allowed permit holders to combine scallop and multispecies limited access permits with some restrictions. The transferee would have had to retire from fishing. A transfer tax would have been applied that would have reduced the active DAS by 10%, 20%, or 50%. Transferred DAS would not have been available immediately, but could only have been used on a graduated scale (20% in year 1, 40% in year 2, and 60% in year 3).

Reactivation of latent effort could have caused a problem to protected species. Transfer to scallop fishing would not have been a problem unless it increased scallop effort in sea turtle high use areas. Transfer of trawl DAS to the sink gillnet component of the fleet would have represented an increase in overall gillnet effort, thus increasing the potential threat to large whales, harbor porpoise, seals, and other marine mammal species. However, the heavy layer of restrictions placed on the use of gillnet in the Gulf of Maine under the ALWTRP and HPTRP would have made transfer to that gear type less attractive than trawl gear.

The No Action alternative does not contain strong measures to control capacity, thus avoiding the potential for latent effort shifting to a more harmful gear type. However, the eventual rebuilding of stocks will bring that latent effort back into the fishery without any control mechanism to reduce overall effort such as the phasing in of effort under the permit absorption alternative. Therefore, this alternative would have represented a more favorable capacity controlling scheme than the No Action alternative.

Alternative 2 - Permit Transfer (Not Selected)
This alternative would have allowed limited access permit holders to transfer their multispecies permits to another vessel, provided they retire from fishing. A transfer tax similar to above would have been assessed, and the reactivation schedule would have been the same as well.

As mentioned above permit transfer and reactivation of latent effort may be a problem to large whales, harbor porpoise, seals, and other marine mammal species due to the potential for transfer from trawl gear to gillnet gear. However, it is not clear how much sink gillnet effort would have been changed by this alternative. The comparison of this alternative to the No Action alternative was the same as above.

Alternative 3 - Days-at-Sea (DAS) Transfer (Selected)
Multispecies limited access permit holders will be allowed to permanently transfer DAS to other multispecies limited access permit holders. Transferring vessels must be of similar size and horsepower, and the selling vessel must retire. Only 60% of active DAS and 10% of inactive DAS may be transferred.

Since DAS are a major limiting factor in total effort, the overall impact to protected species may not be significant. The restriction on use of inactive DAS and the same size and horsepower restriction will mitigate the effect of latent effort transferring to gillnet vessels. This alternative will have less of an impact to large whales, harbor porpoise, seals, and other marine mammal species than the permit absorption or transfer alternatives discussed above.

The comparison of this alternative with the No Action alternative is similar to the above alternatives. However, DAS transfer does represent a more beneficial capacity reducing program for protected species than Alternatives 1 and 2 above.

Alternative 4 - Freeze on Unused Days-at-Sea (Not Selected)
This alternative would have reduced the latent effort in the groundfish fishery by allowing vessels to voluntarily "freeze" their DAS during a specified period ("freeze period") while incrementally reducing the number of "unfrozen" DAS at an annual rate for the duration of the freeze period. Unused DAS would have been reduced by 5% for each year of the freeze period. Vessels could have reentered the fishery after the freeze period with their reduced DAS. Freeze period options would have included; five years, when 75% of the rebuilding target for all species is reached, and when 75% of the rebuilding target for cod, haddock and yellowtail flounder is reached.

Although this alternative would have kept latent effort out of the fishery until the fish stocks are rebuilt, there would have been no assurance that the protected species stocks would have been able to take the increased effort once fish stocks are rebuilt. It is also not clear how many gillnet vessels would have participated in this program. Since the overall potential reduction in frozen DAS would have been less than in Alternatives 1 through 3 above, this alternative did not provide the same effort reduction unless the freeze lasts nearly a decade in length.

Comparison with the No Action alternative is similar in that having some capacity controlling mechanism would have been better than none.

Alternative 5 - Days-at-Sea Reserve (Selected)

This alternative was incorporated in the proposed action for addressing rebuilding requirements discussed below. DAS allocated to each vessel will be divided into three categories A, B, and C. The DAS baseline will be the maximum DAS used in a year that there were 5,000 pounds of groundfish landings for that permit during the period from 1996 through 2001 (estimated total of 68,700 DAS). Category A will be DAS (estimated 41,280 DAS) available under the selected rebuilding alternative, Category B will be DAS available under SAPs and Sector Allocation programs developed by the Council, and Category C will be DAS not used (latent effort) by the vessel. As rebuilding occurs, Category B and then Category C DAS will be available for use. This alternative assures that previously active vessels will regain access to the fishery first.

This alternative will apply to all vessels, a potential added benefit over the voluntary programs above. The influx of latent effort (Category C - DAS) will be delayed under this alternative until after all potential effort now available to the fleet has been restored. Under the NSC Alternative some of the Category B - DAS will be available for use in 2004 under the SAPs and Sector Allocations selected in the above measures.

As in all the Alternatives above, this alternative will provide more capacity controlling benefits than the No Action Alternative.

Alternative 6 - Mandatory Latent Effort Categorization with Voluntary Flexibility Options (Not Selected)
This alternative combines the elements of DAS Reserve with the tools of permit transfer, permit absorption, and DAS transfer. All vessels would have had their DAS categorized in A, B, and C categories as described above. Any permit transfer, absorption or DAS transfer would have carried with it the categories of the seller's DAS. A formula was derived for reactivation of these DAS based on the response of fish stocks to the management program, and a cap would have been placed on the number of permits or DAS an individual is allowed to hold.

As in the DAS Reserve alternative discussed above, there was unlikely to be any direct effect to large whales, harbor porpoise, and seals unless gillnet vessels were favored by the program. This alternative was favored over Alternative 5 above as it allowed permit absorption/transfer or DAS transfer to occur so that the number of participating vessels would be reduced, as well as the overall fleet fishing capacity.

The comparison to the No Action alternative was similar to Alternative 5 above.

5.2.9.4 Management Alternatives to Address Rebuilding Requirements

The Council developed several management measures designed to achieve specific fishing mortality reductions shown in the previous sections. These fishing mortality reductions were based on a constant fishing mortality rate that will achieve rebuilding and/or end overfishing.

Proposed Action
During the comment period for the DSEIS for Amendment 13 the Council received a new alternative to address rebuilding requirements. During deliberations at their November 2003 meeting, the Council selected this alternative for Amendment 13.

The use of DAS will be restricted as follows: (1) 60 percent (estimated to be 41,000) can be used as Category A DAS to fish for any species of groundfish; (2) the remaining 40 percent can only be used as Category B DAS under specific programs that can only catch stocks that have reduced fishing mortality; (3) Category C DAS days will not be available until significant rebuilding has occurred and the latent DAS are unfrozen. Vessels will declare the types of DAS to be used on a trip-by-trip basis. A limited call-in system will be developed to allow vessels to switch from a Category B DAS trip to a Category A DAS trip under certain conditions. The Council will be working to develop the programs similar to the existing SAPs and sector allocation fisheries under which B DAS may be used. Changes were made to the trip limits for GOM cod (to 800/4,000), GB cod (a seasonal limit for hooks, 1,000/10,000 for others), a month was added to the current SNE/MA yellowtail flounder trip limit, and a CC/GOM yellowtail flounder trip limit was adopted. Minor changes were made to various gillnet restrictions regarding the mesh size and number of nets that may be used in certain areas. The gillnet restrictions will serve to cap the total number of nets that may be used.

The total effective effort is estimated to be 68,700 DAS, which is less than the 71,000 DAS level under the Court Ordered baseline. The Category A DAS level is estimated to be between 41,000 which represents almost a 40% reduction over existing levels. However, this alternative will allow vessels to fish under B - DAS for stocks that are not overfished. Several SAPs were approved that could be available for a limited number of vessels to use Category B DAS in 2004. The Council will also be considering other SAPs that may be implemented in the future. This means that overall fishing effort will not be reduced as much as in a pure DAS reduction program such as Alternative 1 below. However, this alternative will provide more protected species benefits than the No Action alternative, and the TAC related measures in Alternatives 3 and 4 since DAS reduction equate to a direct reduction in effort.

No Action Alternative (Not Selected)
This alternative would have left in place the management measures implemented during fishing year 2001. DAS allocations would have returned to levels implemented under Amendment 7. Area closures, gear restrictions and trip limits would have reverted to those in place under Amendment 7 and Frameworks 27, 31, and 33.

The protected species impacts of the management measures in place under Amendment 7 were reviewed by NMFS in a Biological Opinion dated June 14, 2001. The extant Biological Opinion concluded that although jeopardy to right whales was likely, it could be relieved by implementation of certain RPAs. The RPAs are currently in place under the ALWTRP (see details at the beginning of this section). The Opinion also determined that the adverse effects of the existing fishery on sea turtles were not likely to jeopardize the continued existence of those stocks. In addition, the HPTRP measures have reduced the take of harbor porpoise to the point that would allow the stocks to achieve optimum levels. The level of take for the remaining odontocetes and seals that are affected by this fishery are low enough, in relation to the size of their populations, that the stocks would be allowed to achieve optimum levels.

Alternative 1 – Up to 65% Reduction in Used DAS (Not Selected)
In general, a direct reduction in effort by the appropriate components of the fleet would have been beneficial to protected species, and was favored over the other four alternatives proposed. This alternative represents a decrease in DAS over the No Action alternative that would have translated to a direct proportional benefit to all protected species.

This alternative would have phased-in a 65% reduction in used DAS over several years. It was designed to implement the phased-reduction fishing mortality rebuilding strategy. This option used an annually increasing reduction in unused DAS from the 2000-2001 season applied across the fleet DAS allocation, to achieve the individual species mortality reductions in the amendment. The 35% reduction called for in 2004 would have allowed 41,050 DAS. It would then have been ramped down to only 22,100 DAS that could be fished by 2007 at the full 65% reduction level. Depending on the capacity options chosen, this alternative required an additional effort reduction of between 34% and 67% for each permit in 2004.

The effort reduction in the sink gillnet component of the fleet would have been greater than the selected option, and thus would have been of greater overall benefit to large whales, harbor porpoise and seals. Similarly, reductions in trawl effort would have provided more benefit to the sea turtle and small odontocete species that are found in the southern New England region of the Multispecies FMP management area. This option did not provide the immediate effort reduction of Option 1, although its eventual reduction level (65%) was lower than Option 1 (55%) and 5.

Alternative 2 - Reduction in Allocated DAS/Gear Modifications (Not Selected)
This alternative was a combination of additional gear restrictions and reduction in allocated (not used) DAS. The complex matrix of effort controls, closed areas, possession limits and gear restrictions proposed in this alternative were difficult to compare to the more direct approaches offered by Alternative 1 above, and for this reason was not favored over that Alternative. However, this alternative would have provided more protected species benefits than the No Action alternative, and the TAC related measures in Alternatives 3 and 4 since DAS reduction and gear restrictions would have equated to a direct reduction in effort..

Effort Controls – Option 1
Allocated DAS would have been reduced by 20%. Vessels fishing in the Gulf of Maine would have had to sign into that area and would have received a 30% reduction in DAS for that area. In addition, they could only use 25% of their allocated DAS during the May to July period.

The reduced DAS in the GOM for the May to July period would have been a benefit to large whales, but would have been of little added benefit to harbor porpoise and seals as they also concentrate in the area in the fall months. Sea turtles and the pelagic small odontocetes are found outside the GOM and would have received no added benefit from this alternative.

Effort Controls – Option 2
Allocated DAS would have been reduced by 20%. Vessels could only use 70% of their allocated DAS in the GOM regulated mesh area.

The reduced DAS in the GOM regulated mesh area would have reduced effort in the general high use area for marine mammals, thus providing some benefit to large whales, harbor porpoise, seals, and leatherback sea turtles but of no additional benefit to other sea turtles and small odontocetes as they do not forage in the GOM waters.

Closed Areas
In addition to the current closed areas and the seasonal closed areas implemented on August 1, 2002, the area north of 44^0N would have been closed from October to November.

The additional closed area was located to the north of most marine mammal and sea turtle habitats. In addition, leatherback sea turtle and other marine mammal species that are found in the northern GOM and Lower Bay of Fundy have left that area by October. Therefore, this alternative would have provided no additional benefit to protected species except seals.

Possession Limits
Possession limits would have been set at 500 lb/day and 4,000 lb/trip for GOM and GB cod, and 50 lb for yellowtail flounder in areas 514 and 521.

Possession limits may have curtailed trips and/or caused movement in areas fished. To the degree that gillnet vessels would have been affected, it might have benefited large whales, harbor porpoise, and seals unless the area to which the vessels moved was of higher use by protected species. Since current area closures have covered most of the protected species high use areas, this option was not expected to provide any measurable benefit to protected species.

Gear Restrictions
On Georges Bank, trip gillnet vessels would have been capped at 100 to 150 nets, and day gillnet vessels would have been restricted to 50 nets. In the GOM, gillnets set inshore of 70^{0}W would have been restricted to 50 nets, and no tie-down nets could be used in certain areas around Cape Cod.

Net restrictions in the GOM areas would have been a benefit to large whales, harbor porpoise, and seals, although the No Action alternative contains an 80 net cap that was not significantly different than were proposed in this alternative. In addition, a ban on tie-down nets would have provided no additional benefit to protected species, and may have been an adverse effect if the species are more susceptible to the stand-up nets that may have replaced tie-down nets.

Alternative 3 - Area Management (Not Selected)
Six areas were defined that represent the traditional areas fished by certain gear types operating out of specific ports, and targeting similar species. Species-specific TACs would have been defined for each area. Calculation of TAC would have been based either on VTR data, landings from fishing years 1996 to 1998, landings from 1996 to 2000, or the last three years average survey data. A system was set up for assuring adherence to TACs, with subsequent year consequences for exceeding the TAC. Movement was allowed between areas under certain controls and restrictions.

TAC allocation does not by itself reduce impacts to protected species, since vessels can spend the same amount of effort to catch different TAC levels. Although, if the TACs were set low enough to assure a reduction in effort, then an indirect benefit to protected species may have occurred. Separate TACs for each stock would have allowed gear to stay in the water longer as vessels move from stock to stock. Therefore, this alternative would have provided minimal additional benefit to protected species unless the TAC chosen for the high use protected species areas was low enough to reduce effort in those areas. This alternative would have offered less protection to protected species than Alternatives 1 and 2, and the No Action alternative that provided more effort control through DAS restrictions, gear restrictions and closed areas. This alternative was the same as Alternative 4 as far as protected species benefit.

Alternative 4 - "Hard" Total Allowable Catch (TAC) (Not Selected)
TACs would have been applied to all stocks in the multispecies FMP on a single or multi-stock basis. Three options were developed for applying TACs to the multispecies fishery. They included; a separate

TAC for each stock, aggregate TACs for stocks not overfished, hard TACs for directed the groundfish fishery, and target TACs for incidental catch fisheries.

TAC allocation does not by itself reduce impacts to protected species, since vessels can spend the same amount of effort to catch different TAC levels. Although, if the TACs were set low enough to assure a reduction in effort, then a benefit to protected species would occur. Separate TACs for each stock may have allowed gear to stay in the water longer as vessels moved from stock to stock. DAS reductions provide a more direct reduction in impact to protected species than reduced TACs. As stated above, this alternative offered less protection to protected species than Alternatives 1 and 2, and the No Action alternative, and was identical to Alternative 3 as far as protected species benefit.

Recreational Fishing Measures (Selected)
This alternative sets recreational bag and size limits on cod and haddock. Although recreational fishing gear is known to interact with protected species, the size and relative low strength of the gear make it unlikely to cause serious injury to the large whales, dolphins, and sea turtles. Therefore, any measures designed for recreational fishing vessels will not affect protected species, thus providing no added benefit or adverse effect to protected species over the other rebuilding alternatives, including the No Action alternative.

5.2.9.5 Alternatives to Minimize the Adverse Effects of Fishing on Habitat

The following alternatives represent several varying actions, many of which contain closed areas that were proposed to protect the adverse effects of fishing on habitat. Four levels of habitat closure were considered for those alternatives that contain closed areas. The levels of habitat closure selected will make a significant difference in the degree of protection that will be provided to protected species. The four habitat closure levels and their relative benefit to protected species are discussed below.

Level 1 – The area will be closed indefinitely on a year round basis to all fishing gear.
This level will clearly provide the highest level of protection for protected species within the area to which it is applied, as all fishing gear types are prohibited.

Level 2 – Areas will be closed indefinitely on a year round basis to all bottom tending gear (static and mobile)
This level will provide the next highest level of protection, as it will prohibit the major gear types that are known to affect protected species. The gear types that will be allowed would be mid-water and surface gears that generally interact with small odontocetes and sea turtles.

Level 3 – The area would be closed indefinitely to all bottom tending mobile gear.
This level would provide very limited protection to protected species, as only sea turtles are known to be captured in bottom tending mobile gear.

Level 4 – Areas would be open indefinitely on a year round basis to "reduced impact" gear as defined by the Habitat Technical Team.
This level could provide as much protection to protected species as level 1 or 2, or could have no beneficial impact depending on how the "reduced impact" gear is defined.

Alternative 1 - No Action (Not Selected)
This alternative would have used the measures implemented under Amendment 7 and associated Framework measures in place during the 2001 fishing year as adequate habitat protection. See Section 5.2.11.4 above for protected species impacts assessed for the No Action alternative.

Alternative 2 - Incidental Benefit of Other Amendment 13 Measures (Selected)
This alternative uses the other non-habitat-specific measures to be implemented under Amendment 13 as adequate habitat protection. The protection afforded protected species under the alternatives selected by the Council for Amendment 13 are discussed for each alternative in this section. The overall perspective is that the reduction in fishing effort through DAS restrictions will be beneficial to protected species.

Alternatives 3 and 4 – Closed Areas to Protect Hard-Bottom Habitats (Not Selected)
A series of options were proposed to modify existing multispecies closed areas to better protect EFH. The proposed areas were generally adjacent to existing closed areas implemented under MFCMA, MMPA or ESA. As discussed above, the protected species impacts vary according to what Habitat Closure level would have been applied. If areas were to be closed to all gear, then the impacts are generally beneficial to protected species. However, gear specific restrictions to protect EFH generally target mobile gear, and may have encouraged fixed gear such as gillnet or pot gear to move into the area. The impact to large whales and harbor porpoise depends on whether the seasonal restrictions that are in place under the ALWTRP or HPTRP overlay the proposed EFH area. Only one or two habitat closed areas located in the SNE or shelf-edge areas would have protected sea turtles and pelagic odontocetes.

Alternative 5 - Closed Areas Designed to Protect Important EFH and Balance Fishery Productivity (Not Selected)
Under this alternative, EFH areas would have been drawn based on relative productivity of areas for several fish and mollusk species. The impacts to protected species would have been similar to those above. However, this alternative did contain areas off Marthas Vineyard, Nantucket and the New York Bight that would have included sea turtle and pelagic odontocete high use areas.

Alternative 6 - Closed Area Consistent with FW 13 Scallop Closed Areas Access Program (Not Selected)
This alternative would have included areas off Marthas Vineyard, and the offshore New York Bight where sea turtles and pelagic odontocetes are found. Depending on the way in which the EFH areas would have been protected (see discussion above on Habitat Closure level), this alternative may have provided some benefit for sea turtle and pelagic odontocete species.

Alternative 7 - Expand List of Gears Prohibited in Closed Areas (Selected)
The proposed list of expanded gear types that will be prohibited is limited to hydraulic clam dredges. Therefore, the potential impact to large whales, harbor porpoise, and seals is only somewhat beneficial under this alternative.

Alternative 8 - Prohibit Rockhopper and/or Roller Trawl Gear (Not Selected)
Rockhopper and/or roller gear refer to modifications to the footrope of trawl gear that, if prohibited, would have been replaced by some other footrope configuration. Therefore, the use of trawl gear would continue, and the potential impacts to the sea turtle and pelagic odontocetes species that may have been affected by trawl gear would not change.

Alternative 9 - VMS Requirement for all Multispecies Vessels (Selected)

A VMS requirement will not provide any direct beneficial advantage to protected species. However, there are several indirect advantages including providing accurate data on gear use by area, and identifying where fishing effort overlaps protected species high use areas.

Alternative 10 - Closed Areas that are Modifications of Existing Mortality Closures (Selected)
Certain habitat subsets of the existing or proposed multispecies closed areas are identified to provide increased EFH protection. The areas selected will be afforded Level 3 protection, which means that they will be closed indefinitely to all bottom-tending mobile gear. This would provide very limited protection to protected species, as only sea turtles and some dolphins are known to be captured in bottom tending mobile gear. The new areas that are not overlapped by ALWTRP and HPTRP closed areas are an area immediately to the north of the NLSCA and an area to the south of Penobscot Bay in the GOM. Level 3 protection for the area to the north of the NLSCA will benefit sea turtles and some dolphins that may inhabit that area in the summer. However, Level 3 protection in the area south of Penobscot Bay in the GOM will not benefit the large whales, harbor porpoise and seals that frequent the central GOM.

5.2.9.6 Other Issues

Northern Shrimp Fishery Exemption Area (Selected)
The small mesh Northern Shrimp Fishery Exemption Area extends from Cape Cod to the US-Canada border along the near shore waters. Northern shrimp fishing efforts had been restricted to that area. This alternative will remove the area restriction for northern shrimp fishing.

The trawl or mobile bottom gear that is used in the northern shrimp fishery poses no threat to large whales, harbor porpoise, seals and leatherback sea turtles, as it is dragged slowly along the bottom where these mobile species can easily avoid it's slow movement. Therefore, extension of the fishing area will have no affect on protected species since sea turtles (except leatherbacks) and small pelagic odontocetes do not frequent this area.

Tuna Purse Seine Vessel Access to Groundfish Closed Areas (Selected)
Small odontocetes, large whales and sea turtles are occasionally captured in tuna purse seine gear. However, the animals are easily released from the open nets by backing down the gear or otherwise lowering the edge of the seine to provide the animals access to open water. Therefore, although this gear may capture these species, it rarely results in injury to them. Allowing these vessels access to Groundfish Closed Areas is not likely to adversely affect protected species.

SNE General Category Scallop Vessel Exemption Program (Selected)
Scallop dredge gear does not pose a threat to large whales, harbor porpoise, small odontocetes, or seals. Sea turtles are occasionally taken in this gear, and the impacts have been analyzed by the NMFS under the Scallop FMP. The conclusion of a recent Biological Opinion was that the scallop fishery may affect sea turtles, but will not result in jeopardy to the populations involved. This alternative will not increase the scallop fishing effort in the SNE area such that the threat of sea turtle capture would increase.

5.2.9.7 MMPA Conclusions

It is recognized that the multispecies fishery will be prosecuted in the continental shelf waters frequented by several species of offshore odontocetes including Risso's, coastal bottlenose, spotted and striped dolphins. These species generally inhabit the offshore waters off southern New England and the Mid-Atlantic region. Due to their pelagic tendencies, it is unlikely that the bottom-tending trawl gear used by the multispecies fishery will affect these odontocetes. The levels of take of these species in the sink gillnet fisheries has been well documented by long-term NMFS observer effort in Northeast fisheries. The mortality and serious injury suffered by these species has been assessed relative to the PBR allowed under the MMPA for each species and have been found to be below those levels. Amendment 13 will reduce effort providing additional protection to these species.

Pilot whales, Atlantic white-sided, common, and offshore bottlenose dolphins are found entangled in both sink gillnet gear as well as bottom trawl gear. However, their pelagic prey species suggest they do not forage near the bottom, making it unlikely that they would frequently encounter the bottom tending gear used in the multispecies fishery. Therefore, it is unlikely that the small number of animals that are taken in this fishery will be at levels that compromise their ability to maintain optimum sustainable population levels, or result in serious injury and mortality levels that exceed the PBR levels allowed for commercial fisheries under the MMPA. Amendment 13 will reduce effort providing additional protection to these species.

Harbor, gray, and harp seals, as well as minke whales are often entangled in sink gillnet gear used to catch multispecies, although the populations of these species are high relative to the estimated total take. Therefore, the general reduction in effort afforded by Amendment 13 measures will not further inhibit the ability of the seal populations to achieve their optimum sustainable population levels, or result in serious injury and mortality levels that exceed the PBR levels allowed for commercial fisheries under the MMPA.

Harbor porpoise are taken in sink gillnet gear used to catch multispecies as noted in Table 110 that depicts harbor porpoise takes in gillnet fisheries from 1994 to 2001. Although they are found primarily in the northern Gulf of Maine in the summer months, they migrate seasonally through regions where multispecies are caught. For example, they move through the southern New England area where sink gillnet fishing operations occur in the spring (March and April). Harbor porpoise also move through the Massachusetts Bay and Jeffrey's Ledge region in the spring (April and May) and the fall (October November).

Amendment 13 to the Multispecies FMP will decrease effort among all gear components of the fishery. Thus sink gillnet effort in the Northeast Region is likely to be decreasing and will not affect the ability of the HPTRP to maintain the serious injury and mortality levels of harbor porpoise below the PBR levels allowed for commercial fisheries under the MMPA. In summary, the Multispecies FMP will continue to allow harbor porpoise to achieve its optimum sustainable population level.

5.2.9.8 ESA Conclusions

The extant Biological Opinion for the Multispecies FMP concluded that the existing FMP measures in, have been found by NMFS to affect, but not likely to jeopardize the continued existence of the large whales (humpback, fin, blue, sei, and sperm whales). Implementation of the Opinion's RPAs is intended to relieve the initial jeopardy conclusion for the right whale. A no jeopardy conclusion has also been found by NMFS for the green, Kemp's ridley, leatherback, and loggerhead and sea turtles. Furthermore, the NMFS has determined that the multispecies fishery will not affect the endangered shortnose sturgeon, Atlantic salmon, hawksbill sea turtle, roseate tern, piping plover, or the two right whale critical habitat areas found in the Northeast Region.

Given the current critical status of the right whale population and the aggregate effects of human-caused mortality that have led to the species current status, the Council understands that the right whale population cannot sustain additional incidental mortality. The Council also understands that the multispecies fishery uses sink gillnet gear that has caused serious injury and mortality to right whales. All vessels that utilize sink gillnet gear will be operating under the Multispecies FMP due to the requirement that any gear capable of catching multispecies must obtain a multispecies permit. Since a sink gillnet cannot be deployed in the Northeast waters without the possibility of catching a species covered under the Multispecies FMP, they will be included in the effort control measures that have been developed under Amendment 13 to the Multispecies FMP. As described above, these measures will affect significant reductions in effort largely through a DAS reduction plan. Therefore, it is reasonable to assume that Amendment 13 is not likely to increase sink gillnet effort in the Northeast Region, and that the current assessment of jeopardy to right whales could be revaluated. This is based primarily on the understanding stated above, that Amendment 13 to the Multispecies FMP will provide an adequate mechanism to control and reduce fishing effort, and that the restrictive measures implemented under the ALWTRP will continue to provide specific protection to the right whale as well as other large whale species.

5.3 Impacts to Essential Fish Habitat

5.3.1 Clarification of Status Determination Criteria

Status determination criteria (overfishing definitions) were previously adopted in Amendment 9. Alternatives are presented that will clarify and revise the status determination criteria (overfishing definitions). Criteria for most stocks will be based on fully-recruited fishing mortality and spawning stock biomass. In addition, minimum biomass thresholds may be changed to comply with National Standards guidelines. The Amendment also considered three options for revising numerical estimates of these parameters.

Habitat Impacts

The implementation of this measure would result in minimal or no habitat impacts.

5.3.2 Proposed Rebuilding Periods

For stocks that require a formal rebuilding program, the Council considered two different rebuilding periods:

(1) Rebuilding most stocks by 2009
(2) Rebuilding most stocks by 2014 **(selected for most stocks)**

Habitat Impacts

In so far as the 2009 rebuilding timeframe would reduce effort in the groundfish fishery more severely than the 2014 timeframe, rebuilding most stocks by 2009 would have a positive effect on essential fish habitat protection.

5.3.3 Proposed Rebuilding Programs

Three strategies to rebuild overfished stocks were considered in Amendment 13:

(1) A constant fishing mortality during the rebuilding period;
(2) A phased fishing mortality reduction.

(3) An adaptive fishing mortality strategy

The Council selected a combination of a phased and adaptive mortality reduction strategy. The three strategies differ with respect to the timing of reductions in fishing mortality (catch) necessary to rebuild the stocks. The constant fishing mortality strategy would mean more severe reductions in catch during the beginning of the rebuilding period (10 year rebuilding period for most stocks). The phased fishing mortality reduction strategy would not require as severe reductions in the initial years, but larger reductions in fishing mortality would be needed in later years. The adaptive strategy would fish at F_{MSY} through fishing year 2008, and then adjust mortality in order to rebuild most stocks by 2014.

Although the impact of a constant fishing mortality strategy would be immediately beneficial to habitat as compared to the other options, it is not possible at this time to say which types of habitat and essential fish habitat for vulnerable species would be positively or negative impacted more or less under the different strategies. It is likely that under any of the strategies, protection of essential fish habitat will be strengthened as compared to the No Action Alternative.

5.3.4 Fishery Program Administration

5.3.4.1 Fishing Year Change (No Action)

This alternative would change the start of the fishing year, which is currently May, to one of the following options: January 1, October 1, or July 1. The Council selected the No Action Alterative (start of May 1). The fishing year changes considered would have some or all of the following advantages over the current fishing year: minimizes the time lag between new scientific information and incorporation into the FMP, resolves the current mismatch between the stock assessments (based on a calendar year) and the fishing year, facilitates management of trans-boundary stocks (those shared with Canada), and reduces the likelihood of a derby fishery.

The implementation of this measure would result in minimal or no habitat impacts because it doesn't directly affect the frequency or intensity with which the fishery is prosecuted.

5.3.4.2 Periodic Adjustment Process (Selected)

This alternative would combine two existing management committees - the Multispecies Monitoring Committee (MSMC) and the Plan Development Team (PDT) - in order to streamline the management process.

The implementation of this measure would result in minimal or no habitat impacts.

5.3.4.3 Biennial Adjustment (Selected)

This alternative would decrease the frequency of framework adjustments to existing fishery regulations. Compared with the current annual adjustment, the proposed biennial adjustment (every two years) would provide more time for management measures to take effect and allow more time to evaluate the relevant scientific information on the status of the stocks and the effectiveness of the regulations. If necessary, the Council could choose to initiate an adjustment at other times.

The implementation of this measure would result in minimal or no habitat impacts. However, this will allow the effect of regulations on essential fish habitat to be better assessed.

5.3.4.4 Administration of Certified Bycatch/Exempted Fisheries (No Action)

The Council selected the No Action alternative for this measure. As in Amendment 7, the incidental catch of regulated multispecies must be less than 5% of total catch by weight. The other alternative considered proposed alterations to the current rules to provide increased flexibility to administer the exempted fisheries program, and requires periodic review of the current exempted fisheries.

The implementation of this measure would result in minimal or no habitat impacts. However, this may impact habitat negatively if the exempted fisheries programs allow non-habitat friendly gear into areas currently prohibited. Conversely, this may impact habitat positively if the exempted fisheries program under application includes testing gear in areas that may result in reduced habitat impacts.

5.3.4.5 Special Access Program (Selected)

Because management measures are generally applied over a wide geographic area and across many sectors of the fishing industry, access to stocks in good condition is sometimes overly restricted. This alternative addresses this problem by implementing a system to expedite the implementation of regulations that allow access to multispecies stocks that are in good condition, or to non-multispecies stocks that can be harvested without compromising the goals of this amendment. These measures reduce fishing mortality on stocks that are overfished, but also are likely to reduce fishing mortality on stocks that could support an increase in catch.

Three specific special access program are proposed: a program to access GB yellowtail flounder in Closed Area II, a program to allow small incidental catches of winter flounder in the fluke fishery in Southern New England, and a program to facilitate catching the U.S. share of eastern GB cod, haddock, and GB yellowtail flounder under the U.S./CA resource sharing understanding.

5.3.4.5.1 Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program

Allowing fluke vessels fishing west of 72º 30' W to retain small quantities of winter flounder without using a DAS may slightly increase DAS use, since it may free a small number of DAS for directed groundfish fishing that were previously used to retain winter flounder caught on fluke trips. Habitat effects would be negligible.

5.3.4.5.2 Georges Bank Yellowtail Flounder Special Access Program

There is a provision in this alternative allowing for limited fishing (two trips per month during June-December) of yellowtail flounder inside the southern portion of Closed Area II. The area specified is the same as that used in the scallop CAII access program. As this area is primarily of sandy bottom composition, it is less susceptible to the adverse effects of fishing than the gravel bottom area in the northern portion of the closed area. Also, the fact that this area was heavily fished during the CAII access program during 1999-2001 means that any additional habitat impacts associated with trawling for yellowtail are likely to be minimal.

5.3.4.5.3 US/Canada Resource Sharing Understanding (Selected)

This alternative would incorporate the US/Canada Resource Sharing Understanding into the FMP. The informal agreement specifies an allocation of cod, haddock and yellowtail flounder on eastern Georges Bank for each country. Total catches by U.S. vessels from specific areas may not exceed designated quota. U.S. vessels in trans-boundary area would be required to use an approved Vessel Monitoring System. There are a range of measures to ensure the U.S. does not exceed its share.

The DAS adjustment, or tradeoff for vessels that participate in this access program is undefined in the proposal. Therefore, it is impossible to analyze the potential benefit of reduced bottom time in other areas, because the DAS differential rate could be 1:1. In general, if DAS are counted more than on a 1:1 ratio for this program, then it is likely that the amount of time available for fishing is reduced, producing some habitat benefits. The Council selected to give vessels credit for steaming time, so there will not be habitat benefits from reductions in bottom contact time for the amount of time it takes a vessel to get to the access area. In addition, the adjustment downward in mesh size permitted in this access program is not expected to have any additional impacts on habitat.

The length of time that access is granted into Closed Area II is an issue for habitat. The access length of time was not specified, but can be for a period of time between 1 and 10 months. At the extreme, this would reduce Closed Area II from a year round closure to a seasonal two (2) month closure. Year-round closures are believed to generate greater habitat benefits then seasonal closures; therefore, any access will decrease the habitat benefits generated from that area. If the area is open one month versus ten months, the habitat impacts may not vary that much, because most of the negative impacts generated from bottom tending gear is believed to occur from the first pass.

Habitat benefits are reduced when an area is opened to bottom-tending mobile gear as substantiated by the NRC Report and the Gear Effects Workshop Report conclusions about the effect of these gears on the benthic environment. Seasonal closures will reduce gear impacts on habitat, but only for short periods of time. The habitat benefits of seasonal closed areas, as for year-round closures, partially depend upon the types of gear permitted inside them (Table 127). Seasonal closures in the Gulf of Maine eliminate fishing effects on benthic habitats for short periods of time, but probably not long enough to provide any significant habitat benefits. The redistribution of effort (both geographically and amongst other fisheries and gear types) caused by these closures, combined with potential short-term increases in fishing effort inside these areas when they are open, may in fact increase the adverse effects of seasonal area closures on EFH. In addition, because of their intermittent protection, seasonal closures offer less opportunity than year-round closures for growth and recovery of benthic communities that may have been altered by fishing activity. The longer the duration of a closure, the more protection it will afford to fish stocks and habitat in that area. The rolling closures currently in existence afford the greatest degree of protection to benthic habitat in inshore regions of the Gulf of Maine, particularly in the waters north of Cape Cod to Cape Ann.

Nantucket Lightship Closed Area	Closed Areas I and II	Western Gulf of Maine Closed Area	Cashes Ledge Closed Area
Lobster and hagfish traps	Lobster and hagfish traps	Multispecies exempted gear	Multispecies exempted gear
Pelagic longline, hook and line and/or harpoon gear	Pelagic longline, hook and line and/or harpoon gear	Charter, party or recreational vessels	Charter, party or recreational vessels
Pelagic mid-water trawl gear	Pelagic mid-water trawl gear	Lobster and hagfish traps	Lobster and hagfish traps
Surf clam/ocean quahog dredge gear			
Charter, party or recreational vessels			

Table 127- Gears currently authorized for use inside the year-round closed areas.

The Council selected to give the Regional Administrator the authority to authorize the number of trips into the area. It is difficult to predict whether the limitations on number of trips to the area will have an impact on habitat. Option 1 could cause more frequent disturbance if a significant amount of vessels participate in the program, while Option 2 could spread the effort out over a longer period of time.

The habitat analysis below describes the original area that was proposed in the DSEIS, the sediment types and EFH contained in each area based on descriptive environmental analysis. (Methodology of this analysis can be found in Appendix XI). Note, that the access area the Council selected for the final US/Canada SAP is significantly smaller that the northern portion of Closed Area II described in these analyses. The access area is the northern tip of Closed Area II, north of the cod HAPC. Overall, the southern portion of Closed Area II is larger than the northern area proposed for access (Table 128). Both areas are primarily sandy bottom, with some gravelly sand (Table 129). The northern portion of closed area II contains more EFH for species with EFH vulnerable to bottom tending gear, especially juvenile cod, barndoor skate, winter flounder, and winter skate. The southern portion of Closed Area II contains about 3% of scallop (J), haddock (A and J), and yellowtail flounder (A and J) EFH. Overall, neither portion of Closed Area II contain more than 3% of total EFH for any of the species with EFH vulnerable to bottom tending gear (Table 130). Furthermore, it is important to note that the southern area has been exposed to scallop dredge effort through FW11 and FW13 to the Scallop FMP, so this area has been disturbed in the recent past.

	AREA (nm^2)	Percent of Closed Area II
Portion of CAII North of 41° 30	871	44%
Portion of CAII South of 41° 30	1127	56%

Table 128 – Area of the proposed access programs within Closed Area II in square nautical miles and percent of Closed Area II.

	Gravelly Sand	Sand
Portion of CAII North of 41° 30	21%	79%
Portion of CAII South of 41° 30	4%	96%

Table 129 – Sediment Composition of each proposed access area within Closed Area II.

Species with Vul. EFH	Top of CA2	Bottom of CA2
American Plaice (A)	1.2	0.3
American Plaice (J)	0.2	0.0
Atlantic Cod (A)	2.4	1.9
Atlantic Cod (J)	3.2	1.5
Atlantic Halibut (A)	1.5	0.0
Atlantic Halibut (J)	1.5	0.0
Barndoor Skate (A)	2.9	1.5
Barndoor Skate (J)	3.0	2.5
Black Sea Bass (A)	0.0	0.0
Black Sea Bass (J)	0.0	0.0
Clearnose Skate (A)	0.3	0.0
Clearnose Skate (J)	0.0	0.0
Haddock (A)	2.9	2.7
Haddock (J)	2.3	2.7
Little Skate (A)	1.9	1.8
Little Skate (J)	1.4	1.3
Ocean Pout (A)	2.2	1.5
Ocean Pout (J)	0.4	0.8
Ocean Pout (E)	1.8	1.3
Pollock (A)	0.3	0.3
Red Hake (A)	0.1	0.8
Red Hake (J)	1.4	1.0
Redfish (A)	0.6	0.0
Redfish (J)	0.7	0.1
Rosette Skate (A)	0.0	0.0
Rosette Skate (J)	0.0	0.0
Scup (J)	0.0	0.0
Silver Hake (J)	1.3	1.0
Smooth Skate (A)	1.1	0.5
Smooth Skate (J)	0.6	0.1
Thorny Skate (A)	0.5	0.0
Thorny Skate (J)	1.6	0.8
Tilefish (A)	0.0	0.0

Table 130 – Percent of EFH contained in each area for species with EFH moderately or highly vulnerable to bottom tending gear.

Species with Vul. EFH	Top of CA2	Bottom of CA2
Tilefish (J)	0.0	0.0
White Hake (J)	0.9	0.8
Winter Flounder (A)	3.2	0.0
Winter Skate(A)	2.9	2.5
Winter Skate(J)	1.9	1.7
Witch Flounder (A)	0.2	0.0
Witch Flounder (J)	0.0	0.0
Yellowtail Flounder (A)	2.2	2.9
Yellowtail Flounder (J)	1.2	3.0
Area	871.0	1127.0

Table 130 – Percent of EFH contained in each area for species with EFH moderately or highly vulnerable to bottom tending gear.

There are numerous reasons why the Council selected not to include access into the cod HAPC for this access program. The following paragraphs provide some background on the importance of an area that has been designated as an HAPC, and summarizes some of the research that has been done on the habitat of that area. Following a review of the scientific literature for information on areas deserving special attention or species with particular habitat associations, the Council has designated an area on Georges Bank as an HAPC for juvenile Atlantic cod. The Council may consider designating additional habitat areas of particular concern in the future. Additional designations may be based on existing or developing knowledge of species-habitat associations, the unique characteristics of a particular habitat type, the threats to sensitive habitats, or the importance of an area to multiple species.

Several sources document the importance of gravel/cobble substrate to the survival of newly settled juvenile cod (Lough *et al.* 1989; Valentine and Lough 1991; Gotceitas and Brown 1993; Tupper and Boutilier 1995; Valentine and Schmuck 1995). A substrate of gravel or cobble allows sufficient space for newly settled juvenile cod to find shelter and avoid predation (Lough *et al.* 1989; Valentine and Lough 1991; Gotceitas and Brown 1993; Tupper and Boutilier 1995; Valentine and Schmuck 1995). Particular life history stages or transitions are sometimes considered "ecological bottlenecks" if there are extremely high levels of mortality associated with the life history stage or transition. Extremely high mortality rates attendant to post-settlement juvenile cod are attributed to high levels of predation (Tupper and Boutilier 1995). Increasing the availability of suitable habitat for post-settlement juvenile cod could ease the bottleneck, increasing juvenile survivorship and recruitment into the fishery. For these reasons, areas with a gravel/cobble substrate meet the first criterion for habitat areas of particular concern.

Specific areas on the northern edge of Georges Bank have been extensively studied and identified as important areas for the survival of juvenile cod (Lough *et al.* 1989; Valentine and Lough 1991; Valentine and Schmuck 1995). These studies provide reliable information on the location of the areas most important to juvenile cod and the type of substrate found in those areas. These areas have also been studied to determine the effects of bottom fishing on the benthic megafauna (Collie *et al.* 1996; Collie *et al.* 1997). Gravel/cobble substrates not subject to fishing pressure support thick colonies of emergent epifauna, but bottom fishing, especially scallop dredging, reduces habitat complexity and removes much of the emergent epifauna (Collie *et al.* 1996; Collie *et al.* 1997). Acknowledging that a single tow of a dredge across pristine habitat will have few long-term effects, Collie *et al.* (1997) focus on the cumulative effects and intensity of trawling and dredging as responsible for potential long-term changes in benthic communities. For these reasons, the identified area on the northern edge of Georges Bank meets the second criterion, as well as the cumulative effects consideration, for designation as a habitat area of particular concern.

Collie *et al.* (1997) also describe the relative abundance of several other species such as shrimps, polychaetes, brittle stars, and mussels in the undisturbed sites. These species are found in association with the emergent epifauna (bryozoans, hydroids, worm tubes) prevalent in the undisturbed areas. Several studies of the food habits of several demersal species (including juvenile cod) identify these associated species as important prey items (Hacunda 1981; Lilly and Parsons 1991; Witman and Sebens 1992; Casas and Paz 1994; NEFSC 1998). These areas provide two important ecological functions for post-settlement juvenile gadids relative to other areas: increased survivability and readily available prey. Scientists are still not certain if these higher survivability rates ultimately translate into population effects. These areas are also particularly vulnerable to adverse impacts from mobile fishing gear.

Collie et al. (2000), in a follow-up publication, analyzed video images and still photographs recorded at five of the six study sites surveyed in the two 1994 research cruises to George Bank. In the videotapes, the U sites at both depths had slightly coarser sediments (higher frequency of pebble-gravel than sand-gravel); in the still photos, there was a higher frequency of sand and cobble in U sites and a lower frequency of pebbles. Bottom photos showed a high percent cover of colonial hydroids and bryozoans at one of the deep U sites and of the rock-encrusting polychaete, *Filograna implexa*, at both deep U sites. In contrast, at the D sites the gravel was free of epifaunal cover and few animals were visible. Statistical analysis confirmed that the U sites had a significantly higher percent cover of *Filograna implexa*.. However, cover provided by this species was also significantly greater in deeper water than in shallow water. Emergent hydroids and bryozoans were significantly more abundant in the deep U sites, but less abundant at the shallow U site. Significant differences between the disturbed and undisturbed sites were noted. However, overall, the percent cover of all emergent epifauna was significantly higher at the deep sites, but there was no significant disturbance effect. It was clear from this study that depth appeared to be just as important as disturbance.

5.3.4.6 Closed Area Administration (Not Selected)

This alternative contained various options for a policy for access to closed areas and the review of current closed areas.

This alternative could have negative impacts on EFH if the administration of closed area access is not tightly reviewed by the Essential Fish Habitat Technical Team as well as the Council's Habitat Committee. If increased access is provided, this may allow access to Habitat Areas of Particular Concern; some areas of current year round closed areas for groundfish have been identified as Habitat Areas of Particular Concern. Additionally, other areas not under the HAPC designation that are currently part of year round closed areas house complex and possible rare habitats. Future research may show that these areas have an impact on fisheries productivity and ecosystem ecology. Under Option 5, however, access by any commercial vessel would be prohibited in any year-round closures. This option would greatly benefit habitat as compared to the NAA as it provides the current year-round closed areas 100% habitat protection from commercial fishing gear.

There are five potential levels of closure addressed in the Closed Area Administration Section. Any level of closure that permits bottom-tending mobile fishing gear is likely to have negative impacts on the EFH found in that area. Table 131 summarizes the impacts of these five options on EFH (specific closed areas affected are noted in the column heading). A score of "-1" indicates a reduction from the levels of habitat protection afforded by the groundfish management measures that were in place during the 2001 fishing year (the No Action Alternative). A score of "0" indicates no change, and a score of "+1" indicates an increased level of protection.

	Option 1 (All Closed Areas)	**Option 2** (CA I and CA II)	**Option 3** (NLCA)	**Option 4** (WGOM)	**Option 5** (All Closed Areas)
Qualitative Analysis	-1	-1	-1	-1	+1

Table 131 - Qualitative summary of Closed Area Administration Options considered in Amendment 13 (none were selected).

Flexible Area Action System (Selected)
The FAAS is available under the No Action alternative, but has never been successfully implemented in the Northeast. Therefore, eliminating the FAAS will not change the impacts of Amendment 13 on habitat.

5.3.4.7 Leasing Days-at-Sea (Selected)

This alternative proposes a DAS leasing program for the fishery in order to enhance economic viability through increased flexibility. Under this alternative, DAS can be leased one at a time, there is no conservation tax on leased DAS, DAS may be leased for a one-year period, leased DAS must be used during the period of the lease, leasing to more than one vessel is allowed, and only Category A DAS may be leased (see Capacity Alternative 5 for a description). Lease agreements would need to be registered with the NMFS. Additional options within this alternative address administrative and conservation issues related to DAS leasing.

If the conservation issues outlined under this alternative are implemented, it would appear that this alternative will have minimal or no effect on habitat.

5.3.4.8 Recreational Fishing Permit (Not selected)

Amendment 13 considered three permit options for a permit for recreational vessels fishing for multispecies in federal waters, and one No Action option (no permit required in federal waters). The Council selected the No Action alternative.

As most recreational fishing is prosecuted by gears other than those determined to have an adverse effect on EFH (otter trawl, scallop dredge and hydraulic clam dredge), recreational fishing of groundfish in general does not negatively impact habitat. However, a recreational fishing permit requirement would allow managers access to data that will enable them to better understand the impacts, if any, of recreational fishing on EFH.

5.3.4.9 "Running clock" alternatives (Not Selected)

Amendment 13 considered three options for modifying the "running clock" used to calculate trip/possession limits, and selected not to implement any of them.

The considered alternatives will not likely increase effort beyond the NAA, thus the running clock alternatives considered would have minimal or no impact to habitat.

5.3.4.10 Observer coverage (Selected)

This alternative contained two options pertaining to the level of observer coverage in the multispecies fishery. Both options represent an increase in observer coverage over past levels. The Council requested 10% observer coverage and NMFS will determine by 2006 if this level is appropriate.

In so far as observers are able to collect data of interest to EFH management (targeted species, non-targeted and non-regulated species and substrate), increased observer coverage in the multispecies fisheries will indirectly benefit the protection of EFH through a better understanding of the habitats that are fished.

5.3.4.11 Vessel Monitoring System Requirements (Selected)

This measure allows vessels to sign-out of the multispecies fishery and stop VMS messaging for a period of at least 30 days.

This alternative will not impact EFH as it is an administrative issue.

5.3.4.12 Days-at-Sea Counting (No Action)

The Council considered three options for counting DAS: Option 1 maintains the current system. Option 2 counts all trips between 3 and 24 hours in length as 24 hours. Option 3 counts all trips between 3 and 24 hours in length as 24 hours with no partial DAS counted (all days would be in 24 hour increments; for example a trip of 26 hours would count as 2 DAS). They selected the No Action alternative.

Options 2 and 3 will result in the reduction of fishing effort during the transition period as compared to Option 1 or the NAA. This would benefit EFH protection.

5.3.4.13 Handgear Permit (Selected)

The Council considered three options for this measure and selected Alternative 3. Alternative 1 maintains the limits on open access permits that were implemented August 1, 2002. It includes a 200 lb trip limit on cod, and no trip limit on other species. Alternative 2 includes a 300 lb trip limit on cod, haddock and yellowtail combined, with a 200 lb maximum on cod. Permits would be open access. Alternative 3 establishes one limited access permit category and one open access permit category. To be eligible for a limited access permit, a vessel would need to have landed 500 lbs. of cod, haddock, or yellowtail flounder in any one fishing year from fishing years 1997 through 2001 when fishing under the handgear category. The trip limits for this new category would be either a 150 lb or 300 lb trip limit for cod. Open access permits are limited to 75 lbs. of cod.

There are no significant habitat impacts associated with these alternatives.

5.3.4.14 Reporting Requirements (Selected)

The Council considered several alternatives for reporting requirements for vessels and dealers – including the possibility of a VMS requirement for all vessels – to improve monitoring of catches. Many of these options are designed to facilitate monitoring of a hard TAC. The Council selected No Action for vessels with addition of trip identifier paper, and daily electronic dealer reporting within 24 hours of all transactions.

Option 1 would not benefit habitat as it allows the current system to remain. Very little habitat information can be derived from the current VMS system in the groundfish fishery. Options 3 and 4 would improve the knowledge of fishing intensity by area and habitat type. This will benefit EFH protection indirectly.

5.3.4.15 Sector allocation (Selected)

This alternative creates a system for approval of voluntary, co-operative sectors within the multispecies fishery. An organized sector would receive a share of the TAC or available DAS, based on prior history in the case of the TAC or current DAS allocations. The sector would form a plan that when approved by NMFS would control fishing by that sector. This may provide a way for sectors to adapt to the management regulations proposed.

One specific sector is proposed – the GB hook sector. This would implement a sector allocation for Georges Bank cod to the hook sector and allocates a portion of the Georges Bank cod total allowable catch.

The habitat impacts of this alternative will be directly tied to the over-arching alternative chosen. Sectors are not geographically constrained; it is unlikely that they, as a management measure, will have any significant habitat impacts.

5.3.4.16 Gulf of Maine Inshore Conservation and Management Stewardship Plan (Not Selected)

This plan was not selected by the Council. It proposed specific management measures that would control fishing in the Gulf of Maine. It is based on an understanding of cod distribution in and migration in this area. Because it does not address fishing in all areas, it is not a stand-alone alternative and would have to be combined with other measures in other areas. It could, for example, be used as the measures for the GOM under an area management proposal. The provisions of this alternative include:

--Creates two inshore Gulf of Maine areas and one offshore area
--Prohibits night trawling
--Begins the fishing year July 1
--Increases the Gulf of Maine cod trip limit slightly
--Recreational fishing limits would be similar to those currently in place
--Each area subject to a 'hard' TAC (see discussion above for a description of 'hard' TAC).
--DAS allocations will be the number of DAS implemented August 1, 2002, with the exception that vessels with less than 25 DAS would be allocated a minimum of 25 DAS.
--Unused permits could be purchased by State management agencies and converted into state permits to allow small-scale groundfish fishing with traps, hooks, or jigging machines.
--20% observer coverage for groundfish trips, and recommends 100% coverage of mid-water trawl trips.
--Rolling closures and year round closures would be similar to those currently in effect.
--Gear restrictions include 6.5 inch mesh, 10" maximum rockhopper size, limitation on groundcable length, 50 gillnet maximum, and 2,000 hook maximum.

This alternative does not meet the biological objectives for stocks outside of the Gulf of Maine and would have to be adopted in conjunction with another rebuilding alternative. It employs three separate management areas within the Gulf of Maine, similar in concept to Rebuilding Alternative 3. It uses possession limits and effort controls (vice hard TACs) to control mortality in these management areas.

The possession limit for this plan is 600 lbs/day / 6,000 lbs/trip on cod for all three GOM management areas. The impacts of this trip/possession limit are likely to be similar to those discussed in Rebuilding Alternative 1.

To reduce overall fishing effort this alternative employs DAS reductions, equal in amount to the maximum number of DAS utilized in any single year and not to exceed the allocation of FY 2001. All vessels under 50 ft possessing a multispecies permit are allocated 25 DAS minimum.

The difference between the total DAS allocated under this plan and the DAS allocated in FY 2001 are to be "frozen." There is a provision for "thawing" these DAS for use by vessels "diversifying" their fishing habits by targeting groundfish part-time. Such vessels would be permitted to utilize fish traps or hooks only. Anticipated DAS reductions are not quantified in this document; it is therefore impossible to assess potential impacts to habitat. The concept of re-introducing "thawed" DAS to low-impact gears, though, may have positive habitat impacts beyond the direct benefits of reduced effort if the amount of DAS "frozen" is large. If vessels in the "diversification" program shift their fishing effort from higher-impact fisheries (inshore scalloping, shrimp trawling, etc) to groundfish fishing with hooks or fish traps, there may be an overall reduction in the amount of bottom contact by trawl nets.

Several gear restrictions with potential habitat impacts are proposed under this alternative. For trawl gear operating in the two inshore areas, a maximum limit of 10 inches is imposed for roller/rockhopper gear. See Habitat Alternative 8 for more details on the potential habitat benefits associated with reducing the size of roller/rockhopper gear.

There is a provision for annually decreasing the maximum legal length of cables deployed (defined as distance between the wind and the doors). Decreasing this distance may have an impact on areas targeted by otter trawl gear. As a result of these restrictions, vessels may be limited in the depths of water they can effectively fish in. This is presumed to be a benefit for specific geographic areas, as deeper (and potentially "low energy"—see Physical Environment Section) areas become de-facto off-limits to mobile bottom-tending gear.

There are provisions for increasing the minimum mesh size for trawl nets and reducing the number of gillnets and longline hooks. There are no habitat implications for the increases in mesh size for gillnet gear. The limitation imposed on longline vessels may result in less gear deployed, which may have a corresponding benefit to habitat. Seasonal closures similar to those discussed in Rebuilding Alternative 2 are also proposed here.

5.3.5 Alternatives to Control Fishing Capacity

Since the implementation of the DAS program under Amendment 5, a large portion of the total number of allocated DAS has not been used. Such unused DAS (also known as 'latent effort') represent potential future fishing effort. Without some type of control on this latent effort, the use of DAS could increase and thus make it more difficult to rebuild stocks. The following alternatives were designed to reduce unused DAS and provide additional flexibility to the industry by allowing, for example, transfer of permits or DAS. The Council selected **two** of these strategies to reduce capacity.

--Permit absorption proposal
--Permit transfer proposal
--DAS transfer proposal **(Selected)**

--Freeze on unused DAS
--DAS reserve proposal (Groundfish PDT proposal) **(Selected)**
--Combined voluntary/mandatory alternative

Many of the measures discussed in this section address capacity issues affecting latent (unused) effort. Such measures have significant impacts on future effort levels, which may expand dramatically as fish stocks rebound and anticipated revenues from the groundfish fishery increase. If latent effort re-enters the groundfish fishery, there will be an adverse impact on EFH; the magnitude of this impact is likely to be similar to overall DAS allocation increases.
Six alternatives for reducing capacity in the groundfish fishery were considered in the Amendment 13 draft document.

Any measures aimed at reducing the amount of time spent fishing by mobile gear vessels will likely have benefits to EFH, but the degree of this benefit varies considerably based on fishery entry/exit decisions, geographic areas targeted by affected fisheries and the impacts of other regulatory requirements. Many of the measures discussed in this section address capacity issues affecting latent (unused) effort. Such measures have significant impacts on future effort levels, which may expand dramatically as fish stocks rebound and anticipated revenues from the groundfish fishery increase. If latent effort re-enters the groundfish fishery, there will be an adverse impact on EFH; the magnitude of this impact is likely to be similar to overall DAS allocation increases.

All four alternatives include options that would reduce DAS by as much as 50%/90% for active/inactive permit holders. This will reduce the amount of latent effort re-entering the fishery as the resource condition improves.

5.3.6 Alternatives to Address Rebuilding Requirements

The Council developed several management measures designed to achieve specific fishing mortality reductions shown in the previous sections. These fishing mortality reductions were based on a constant fishing mortality rate that will achieve rebuilding and/or end overfishing. During the comment period for the DSEIS for Amendment 13 the Council received a new alternative to address rebuilding requirements. During deliberations at their November 2003 meeting, the Council selected this alternative for Amendment 13. The proposed action is described in detail in Section 3.6.

5.3.6.1 Habitat Impacts of Commonly Used Management Tools

A suite of seven management tools is utilized in various combinations within the alternatives designed to meet rebuilding objectives. The impact of each of these tools upon EFH, in general terms, is summarized below. The impacts from these general tools will be utilized in the evaluation of management alternatives to follow.

5.3.6.1.1 Days-At-Sea Reductions

There are a number of factors that will affect the speed and degree of habitat recovery in areas where bottom tending mobile gear use is reduced. These include: 1) the degree, duration, and extent of fishing in the area; 2) any other anthropogenic sources of habitat disturbance (e.g., contamination of bottom sediments in coastal waters); 3) the natural disturbance regime (e.g., frequency and intensity of storms, bottom currents, etc.); 4) the type of substrate or sediment; 5) depth; 6) the type of benthic organisms that inhabit the area; and 7) the length of time that the area remains undisturbed by fishing. Improvements in habitat quality would most likely occur in areas where trawling and dredging activity was minimal to begin with and is totally eliminated, or substantially reduced; in deeper, low-energy locations not exposed to storm events or strong bottom currents; in hard-bottom areas (in shallow or deep water) that support prolific growth of large, attached epifauna, or in other bottom habitat types that provide food and cover for demersal fish; and in areas populated by benthic organisms that grow faster and reproduce quickly. For some benthic environments that have been altered by fishing activity, complete recovery could take years. For others, recovery might only take a few months. If reductions in bottom trawling activity in marginal areas are temporary and increase after a year or two as stock abundance increases, habitat recovery in certain areas may never be complete.

A useful conceptual model for understanding the relationship between changes in fishing effort and the degree of habitat modification described in the National Research Council report on trawling and dredging effects (NRC 2002). Starting from zero fishing effort with no habitat impact, a change in fishing effort will change the degree of habitat modification, but as effort continues to increase habitat alteration reaches its maximum point and levels off even as effort continues to increase. For heavily modified habitats exposed to high levels of fishing activity, effort must be reduced substantially before any improvement in habitat quality is realized. Although there is much uncertainty regarding the relationship between fishing effort and habitat alteration at low effort levels, it is probably not linear as depicted in NRC 2002. A more realistic relationship, at least for certain habitats exposed to mobile bottom-tending gear, is curvilinear since the first few tows in an undisturbed habitat would be expected to produce the greatest relative change in habitat conditions (e.g. three-dimensional structure), with reduced effects as fishing effort increases to the point of maximum habitat modification. In this scenario, reductions in effort would have to be even more severe (approaching zero effort) in order to achieve, say, a 50% habitat recovery.

Most of the available studies of gear effects for mobile gear types used in the Northeast region examine the effects of single or multiple tows in previously fished or un-fished locations within some defined time period, with control plots in nearby undisturbed locations. There are a few studies that compare benthic communities or physical habitat features in areas exposed historically to different levels of fishing effort. One of them (Frid et al. 1999) compared periods of low, medium, and high otter trawling activity at two sites in the North Sea over a 27-year period. At the heavily-fished, mud-bottom, site, benthic organisms that were predicted to increase as fishing effort did increase in abundance, but organisms that were expected to decrease in abundance did not. At the lightly fished, sand-bottom site, there was a correlation with primary production, but no correlation with fishing effort. In a similar study, Kaiser et al. (2000b) compared benthic communities exposed to high, medium, and low fishing intensity by otter trawls, beam trawls, toothed scallop dredges, and lobster pots in the English Channel (sand substrate) and found no significant effects of increased effort on the numbers of benthic organisms or species, but did find reductions in the abundance of larger, less mobile, emergent epifauna and increased abundance of more mobile invertebrate species, fewer larger organisms, and more smaller organisms in high effort areas. Two factors that complicate this kind of research are the effects of different habitat conditions (e.g., depth, sediment type) that may exist at low and high-effort sites, and temporal changes in environmental conditions (e.g., changes in sediment composition or water temperatures) that occur over the time period being investigated.

More direct evidence of the effects of changes in bottom fishing effort is provided by studies that relate progressive increases in disturbance to changes in benthic community structure and seafloor topography and sediment composition. Jennings et al. (2001) documented effects of increasing beam trawling activity on sand and muddy sand-bottom communities in the North Sea. Thrush et al. (1998) did the same for 18 stations (mud and sand bottom) in Hauraki Gulf, New Zealand, that were fished at varying levels of effort by otter trawls, Danish seines, and toothed scallop dredges. Unfortunately, these studies examine the combined effects of a number of gear types, including toothed scallop dredges and beam trawls that are not used in the Northeast region of the U.S. Nevertheless, a number of significant impacts to benthic communities are identified which can probably, to some extent, be generalized to dredging and otter trawling on similar habitat types in the Northeast region. These included decreased infaunal and epifaunal biomass (North Sea), decreased densities of large epifauna, echinoderms, and long-lived surface dwellers, and increased densities of small, opportunistic species (New Zealand).

There are three experimental studies of the habitat effects of increasing otter trawling effort in commercially un-exploited areas. Two of these were performed in mud-bottom habitats, one in Sweden (Hansson et al. 2000) and the other in Scotland (Tuck et al. 1998). Another (Moran and Stephenson 2000) was conducted in Australia on sandy substrate. In the Swedish study, two tows were made per week for a year in an area closed to fishing for six years. During the last six months of the experiment, 61% of the infaunal species were negatively affected (i.e., they decreased more or increased less in the trawled sites compared to the control sites), and there were significant reductions in brittle stars (compared to a control area), but not in polychaetes, amphipods, or mollusks. In the Scottish study, multiple tows were made during a single day for 16 consecutive months in an area closed to fishing for more than 25 years. Increased bottom trawling produced door tracks, increased bottom roughness, but had no effect on sediment composition. There were significant increases in the number of infaunal species after 16 months of disturbance, but no changes in biomass or total number of individuals; community structure, however, was altered after five months and community diversity declined six months after trawling ceased. Effects on species groups varied: polychaetes increased in abundance while bivalves decreased in abundance five months after trawling began. In the Australian study, four tows made at 2-day intervals on the same area of bottom. Underwater video surveys showed that the first tow reduced the density of large (>20 cm) benthic organisms by 15% and four tows by 50%. Sainsbury et al. (1997), working in the same general area, reported that a single pass of a trawl footrope removed 89% of sponges larger than 15 cm.

Although there is some information (summarized above) that documents habitat modifications that result from <u>increasing</u> fishing effort by mobile bottom-tending gear, there is no corresponding evidence of the effects of progressive <u>reductions</u> in fishing effort on benthic marine habitats. There are, however, a number of studies that document the recovery of benthic habitats following the cessation of bottom fishing. These have been performed in areas that have been closed to various types of fishing activity, mostly by mobile bottom-tending gear. Tuck et al. (1998) monitored the recovery of a mud-bottom benthic habitat for 18 months in a closed area in Scotland after 16 months of bottom trawling and found that door tracks were still visible after 18 months, and that the infaunal community had recovered completely within the same period. This is the only directed study of recovery from simulated commercial trawling activity that has been conducted. Other observations have been made by a number of authors who have monitored the recovery of benthic habitats from single trawl or dredge tows, or following multiple tows in a single day (see section 9.3.2). Kenchington et al. (2001) did note that infaunal organisms that were reduced in abundance during one of three years of experimental fishing in a closed area on the Grand Banks had recovered by the time experimental fishing resumed a year later and Schwinghamer et al. (1998), working on the same project, noted that door tracks lasted up to a year and seafloor topography recovered within a year's time. Sainsbury et al. (1997) compared historical survey data – collected before and after commercial fishing started – to data collected in an area in Australia that remained open to trawling and another area that was closed for five years and reported increased catch rates of fish associated with large epifauna and small benthic epifaunal organisms (but not large ones) within the five-year period.

5.3.6.1.2 Year-round Closed Areas

The benefits of year-round closed areas are dependent upon the types of habitat within the closed area and the sensitivity of that habitat to disturbances. Sensitive habitats that require long periods of time for recovery from disturbances (e.g. complex habitats with biogenic structure) would accrue greater benefits from long-term closure. Less sensitive habitats that have rapid recovery rates (e.g. high energy sand environments) may not accrue additional benefits from long-term closures.

Furthermore, long term area closures provide levels of protection to EFH that are commensurate with the habitat impacts of the gear that they prohibit. For example, the Nantucket Lightship Closed Area likely provides less habitat protection than do Closed Area I and Closed Area II based on the inclusion of surf clam/ocean quahog dredge fishing vessels as permitted gear inside this area (see Table 132). (See Gear Effects Evaluation Section) for more details on the impacts of specific gears on EFH).

Nantucket Lightship Closed Area	Closed Areas I and II	Western Gulf of Maine Closed Area	Cashes Ledge Closed Area
Lobster and hagfish traps	Lobster and hagfish traps	Multispecies exempted gear	Multispecies exempted gear
Pelagic longline, hook and line and/or harpoon gear	Pelagic longline, hook and line and/or harpoon gear	Charter, party or recreational vessels	Charter, party or recreational vessels
Pelagic mid-water trawl gear	Pelagic mid-water trawl gear		
Surf clam/ocean quahog dredge gear			
Charter, party or recreational vessels			

Table 132- Gears currently authorized for use inside the year-round closed areas.

Year-round closed areas that are fished periodically or seasonally by bottom tending mobile gear (e.g. scallop access to NLCA, CAI and CAII) offer significantly less protection for habitat than those that are not fished by mobile bottom gear. In such cases, the affect on habitat is similar to the effects of seasonal closures. Here again the impact is greater for complex habitats than "high-energy" sand habitats, which may be able to sustain periodic fishing by mobile gears.

Year-round closed areas have a very serious distributional affect, which can be a potential cause of adverse impacts upon EFH. This impact may be even more severe than anticipated in areas where little information about bottom type exists. Kaiser et al. (2002) note "the inappropriate use of closed areas may displace fishing activities into habitats that are more vulnerable to disturbance than those currently trawled by fishers. Management actions that force [fisherman] to redistribute their effort may be more damaging in the longer term." While much is known about the habitats of the northwest Atlantic, much is also unknown. The impacts of year-round closed areas on EFH outside areas closed cannot be quantified at this time.

Additionally, the impacts of closure cannot be quantified for areas contained within the closure. There is no published literature detailing the specific habitat benefits from the long-term year-round closed areas on Georges Bank. However, there is growing literature on the benefits of long-term closures to fisheries productivity and habitat complexity related to Marine Protected Areas and Marine Reserves in other marine ecosystems (Woods Hole Oceanographic Institution 2001).

Additionally, year-round, long-term closed areas are most suitable as locations for many types of habitat research. In order for scientists to invest time and money into habitat research, including gear effects research and habitat recovery experiments there is a need for the scientific community to be assured that experiments will not be compromised by fishing gear or other controllable disturbances.

Collie et al. (1997) sampled two shallow (42-47 m) and four deep (80-90 m) gravel sites in U.S. and Canadian waters on eastern Georges Bank during two cruises in 1994 that were classified as disturbed (D) or undisturbed (U) by bottom-tending mobile gear based on the number of dredge and trawl tracks in side-scan sonar images, the presence or absence of large boulders and epifauna in bottom photographs, and 1993 records of scallop dredging effort in ten minute squares of latitude and longitude in U.S. waters on the bank. There were three U sites and one D site in deep water and one U and one D site in shallow water. Bottom substrates were predominantly pebble/cobble with or without encrusting organisms, with some overlying sand. Quantitative samples of epibenthic organisms (>10 mm) were collected with a 1 m-wide Naturalists' dredge fitted with a 6.4 mm square mesh liner. Organisms such as colonial sponges, bryozoans, hydroids, and the tube-dwelling polychaete *Filograna implexa* that were not quantitatively sampled by the dredge were excluded from analysis.

There were significant effects of fishing and depth on total density, biomass, and an evenness diversity index based on abundance and some evidence of a gradient in abundance, biomass, and species diversity from deep, undisturbed sites (high values) to shallow, disturbed sites (low values). However, because of the significant depth effects and depth x disturbance interactions, fishing disturbance alone was not a significant factor. Cluster analysis identified a group of six species that were abundant at U sites and rare or absent at D sites and were not affected by depth: this group included two species of shrimp, a tube-dwelling polychaete, a nemertean, horse mussels, and a bloodstar. Six other species groups were defined either by depth or some combination of depth and disturbance level, or included species that were ubiquitous.

Collie et al. (2000), in a follow-up publication, analyzed video images and still photographs recorded at five of the six study sites surveyed in the two 1994 research cruises to George Bank (see above). In the videotapes, the U sites at both depths had slightly coarser sediments (higher frequency of pebble-gravel than sand-gravel); in the still photos, there was a higher frequency of sand and cobble in U sites and a lower frequency of pebbles. Bottom photos showed a high percent cover of colonial hydroids and bryozoans at one of the deep U sites and of the rock-encrusting polychaete, *Filograna implexa,* at both deep U sites. In contrast, at the D sites the gravel was free of epifaunal cover and few animals were visible. Statistical analysis confirmed that the U sites had a significantly higherhigh percent cover of *Filograna implexa*.. However, cover provided by this species was also significantly greater in deeper water than in shallow water. Emergent hydroids and bryozoans were significantly more abundant in the deep U sites, but less abundant at the shallow U site. Overall, the percent cover of all emergent epifauna was significantly higher at the deep sites, but there was no significant disturbance effect.

5.3.6.1.2.1 Fishing Activity in Closed Areas

Year-round closed areas that are fished periodically or seasonally by bottom tending mobile gear (e.g. scallop access to NLCA, CAI and CAII) offer significantly less protection for habitat than those that are not tended by mobile bottom gear. In such cases, the effect on habitat is similar to the effects of seasonal closures. Here again, the impact is greater for structurally complex hard-bottom habitats than "high-energy" sand habitats, which may be able to sustain periodic fishing by mobile gears. Deep-water mud bottom habitats in the WGOM closed area may also be susceptible to the adverse impacts of mobile, bottom-tending gear which are used there (shrimp trawls).

An analysis of fishing activity by trawl, handline and trap vessels from 1998 to 2001 within year-round closed areas revealed that the greatest number of trips was made within the Western Gulf of Maine closure. Trawls operating in closed areas are either in a class of gears that are exempted from the regulations in the NEFMC Multi-Species FMP or are associated with an exempted fishery. The majority of trips made by trawl vessels in closed areas were clustered in the northwest corner of the WGOM closed area (**Figure 146**). These vessels are predominantly shrimp trawlers operating in the Northern Shrimp Fishery Exemption Area and midwater trawlers targeting herring. Activity by handline vessels was concentrated in the southwest corner of the WGOM closure and the northwest corner of Closed Area I (**Figure 147**). Very few trips were made in the NLCA and CAII. The majority of handline vessels were targeting tuna and other high value species. Trap activity by vessels primarily targeting lobster was concentrated in the WGOM particularly at the southern end of the closure (**Figure 148**). A dense strip of activity by these vessels is evident in the central region of Closed Area II. More trap vessels operated in CA I, CA II and NLCA than vessels using other gears. Overall, limited fishing activity takes place within year-round closures by vessels using gears of any type.

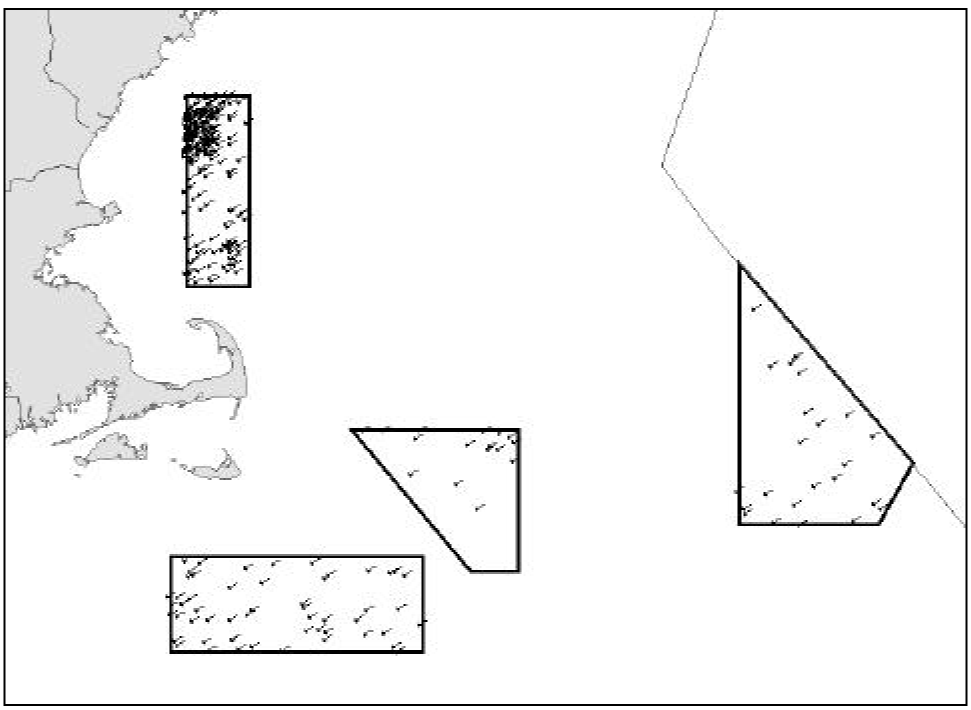


Figure 146 – 1998-2001 trawl vessel reported activity inside the year-round Closed Areas (targeted species are primarily shrimp and herring)
Source: VTR database
Each symbol represents a single trip.

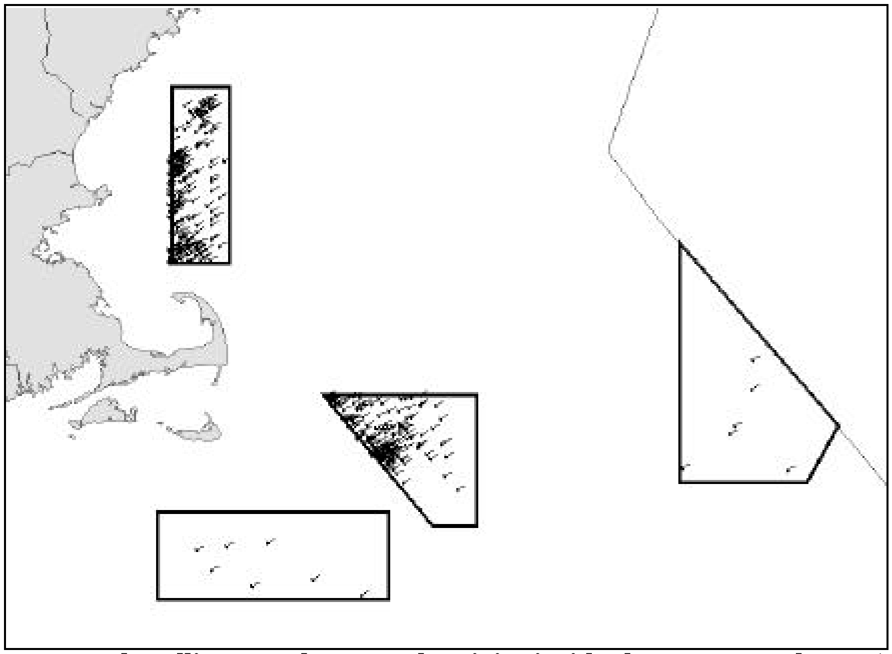


Figure 147 – 1998-2001 handline vessel reported activity inside the year-round CAs (targeted species is primarily tuna)
Source: VTR databas.Each symbol represents a single trip.

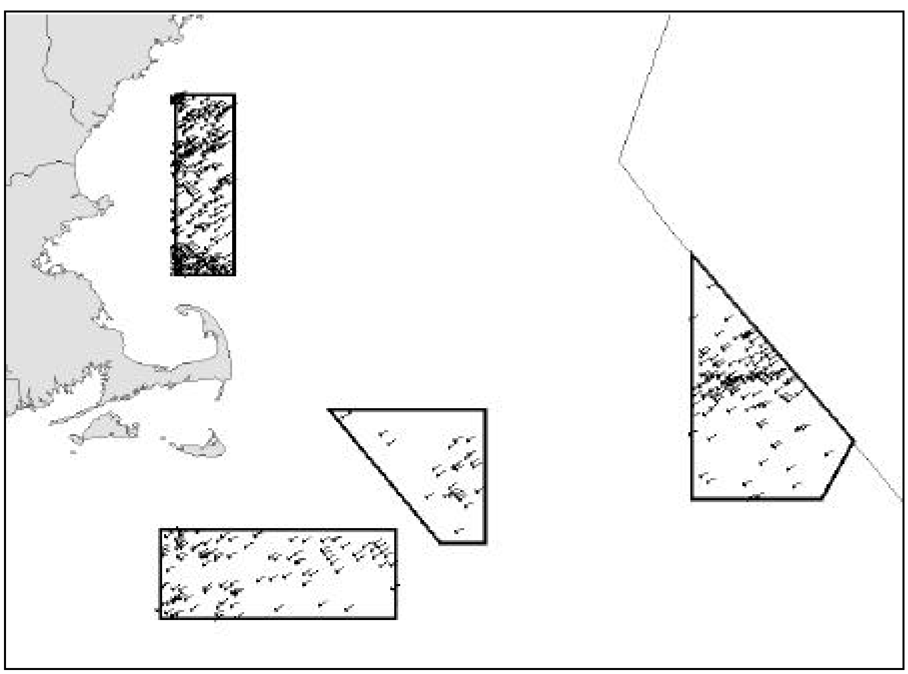


Figure 148 - 1998-2001 trap vessel reported activity inside the year-round CAs (targeted species is primarily lobster)
Source: VTR database. Each symbol represents a single trip.

A scallop access program, established in CAII in June 1999 and in CAI in June 2000, also generated fishing activity in the closed areas by scallop vessels operating under certain gear restrictions (**Figure 149**). Most trips by scallop vessels fishing in closed areas were made in the southern half of Closed Area II, the central region of Closed Area I, and the northeast corner of NLCA. **Figure 150** shows that fishing activity by surf clam/ocean quahog vessels was limited in 2001, with most of the reported trips located in the northwest corner of NLCA.

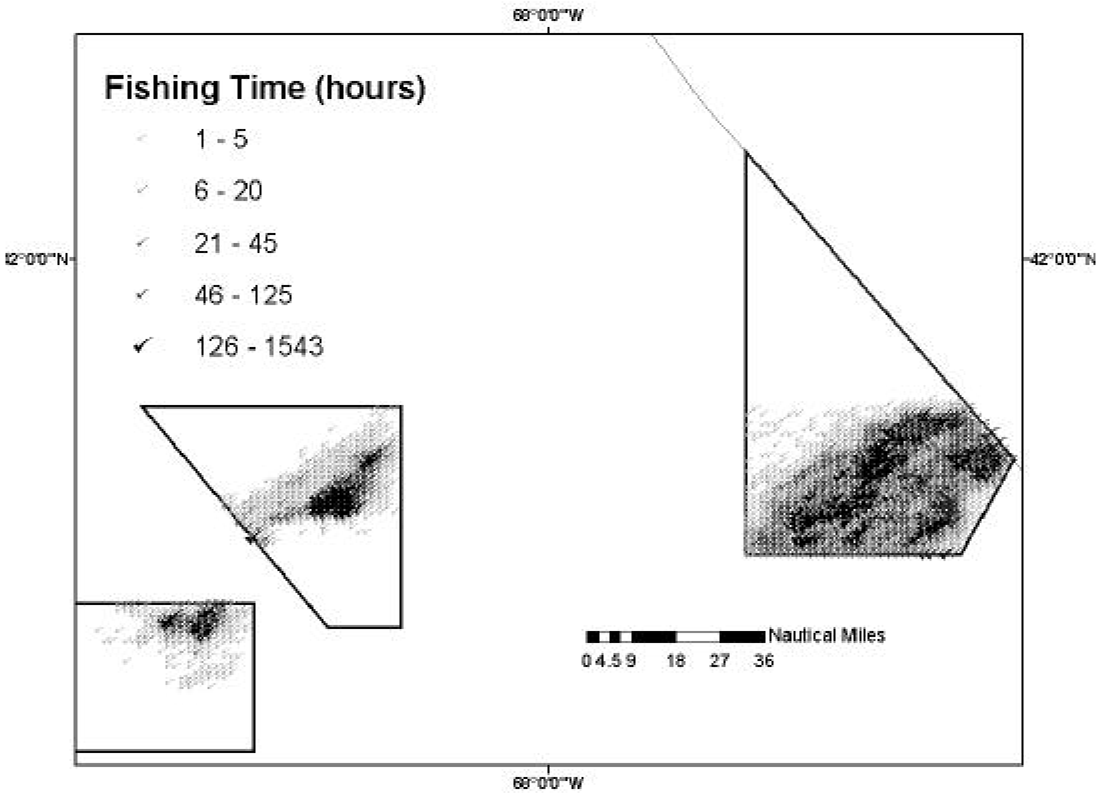


Figure 149 – Scallop vessel activity during the scallop Framework 13 Access Program
Source: NMFS VMS Data

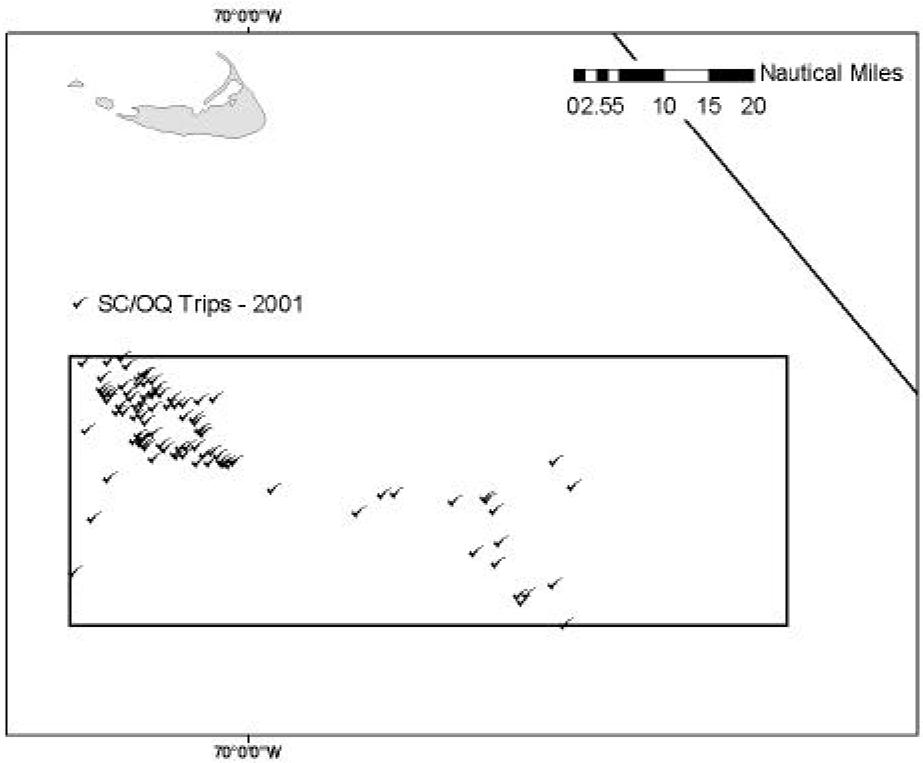


Figure 150 – Surf Clam/Ocean Quahog activity, 2001 (only)
Source: VTR data

Figure 150 shows that limited fishing activity by surf clam/ocean quahog vessels occurred in 2001, with all documented trips located in the northwest corner of NLCA.

All trips made by vessels in closed areas from 1998 to 2001 are represented in **Figure 151**, each symbol representing a single trip, with trip duration indicated for scallop/ocean quahog activity. Fishing activity by all gear types was concentrated throughout the WGOM closure, in the central region of CA I, and at the southern end of CA II. Fishing effort was patchy throughout NLCA, with two small areas of greatest trip density occurring at the northwest and northeast corners. Without more specific information on the intensity of fishing effort on different habitat types in the closed areas, it is difficult to evaluate the degree to which benthic habitats in the year-round closed areas have been affected. As long as these same exempted gears continue to be used in the groundfish closed areas, it is expected that any future impacts on habitat resulting from these activities would be the same as they have been during the last few years. Despite the fishing activity that occurs within groundfish year-round closed areas, they still provide important habitat protection benefits.

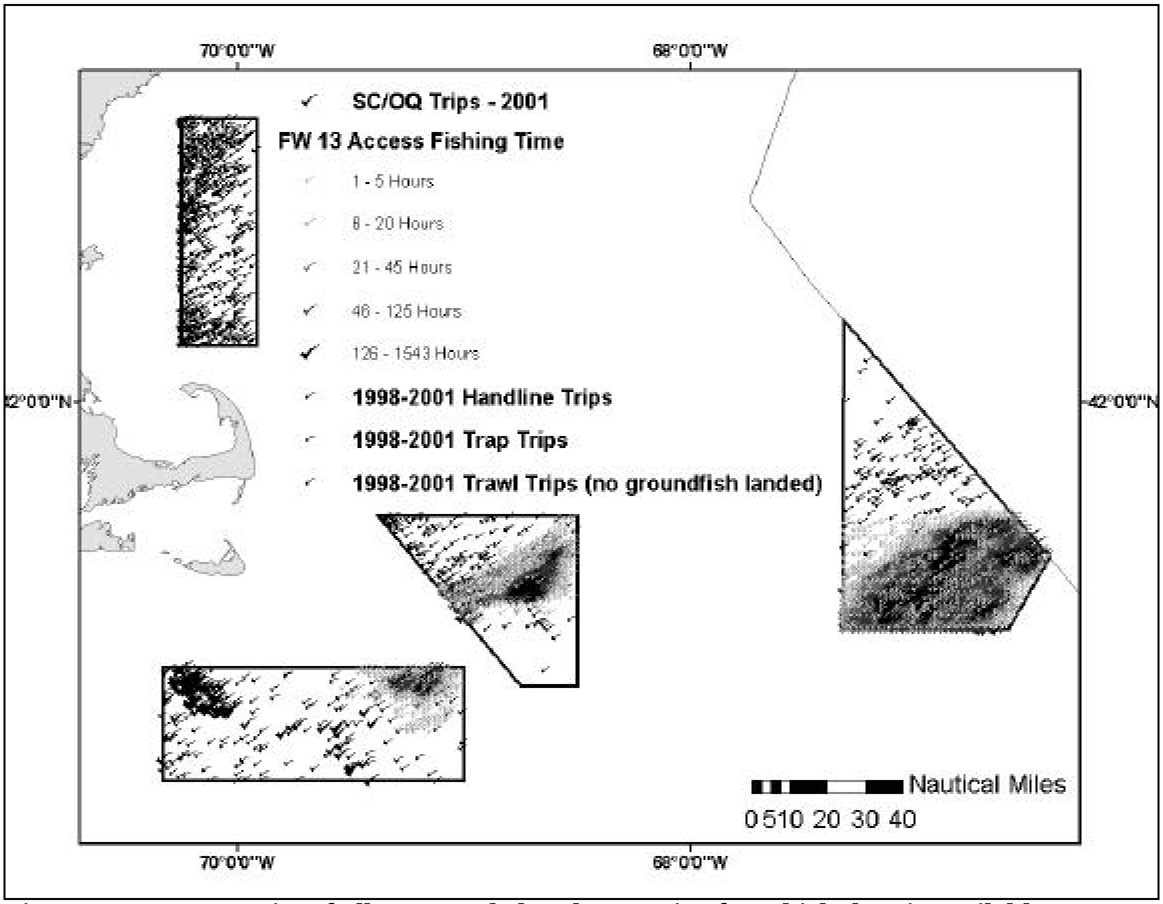


Figure 151 – Composite of all exempted closed area trips for which data is available
Source: NMFS VTR data, NMFS VMS data

The impacts of year-round closed areas on EFH outside the closed areas during the last 5-8 years cannot be quantified at this time, but it is clear that the area closures on George Bank have resulted in a concentration of fishing effort just outside the perimeters of the closed areas. This can be seen by comparing the distribution of scallop dredge fishing activity in 1998, the year before portions of the closed areas were opened up to scallop dredging, with scallop fishing activity in subsequent years (see Figure 152 - Figure 154)**.** Bottom trawling activity during the seven years following the establishment of the Georges Bank closures (1995-2001) has been concentrated in certain more or less discrete areas (see Gear Effects Evaluation/Distribution of fishing activity by gear type section of SEIS). A comparison of more recent, post-closure, fishing activity with pre-closure 1991-1993 bottom trawling activity (NRC, 2002) indicates that, as trawling effort has been displaced of out of the three closed areas on Georges Bank, there has been an increase in activity in deeper water along the edge of the shelf and in southern New England. Other areas, such as the Gulf of Maine and the Great South Channel, were fished heavily during both time periods.

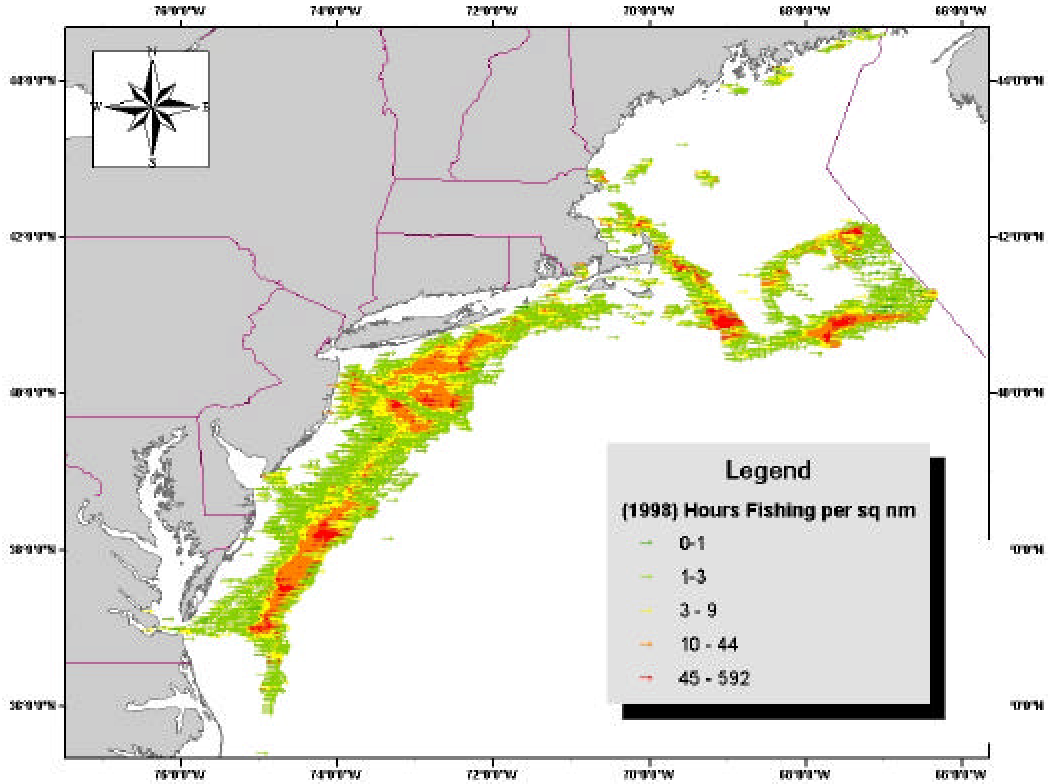


Figure 152 – 1998 Vessel Monitoring System Data for Scallop Fishery.

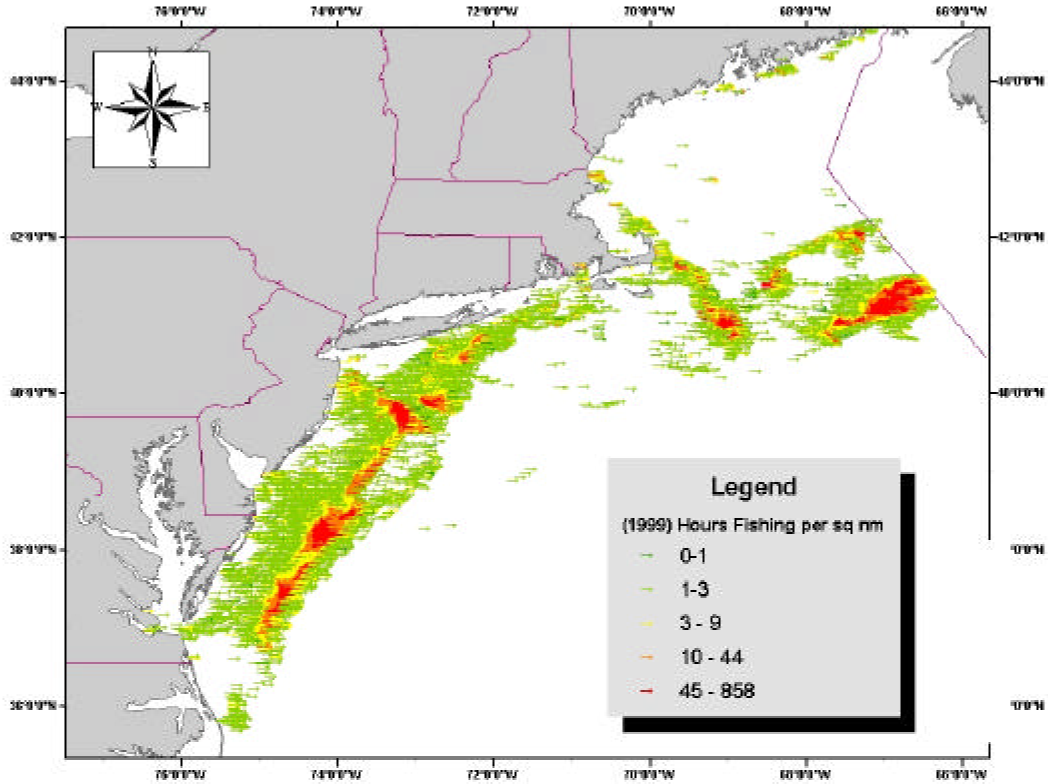


Figure 153 - 1999 Vessel Monitoring System Data for Scallop Fishery.

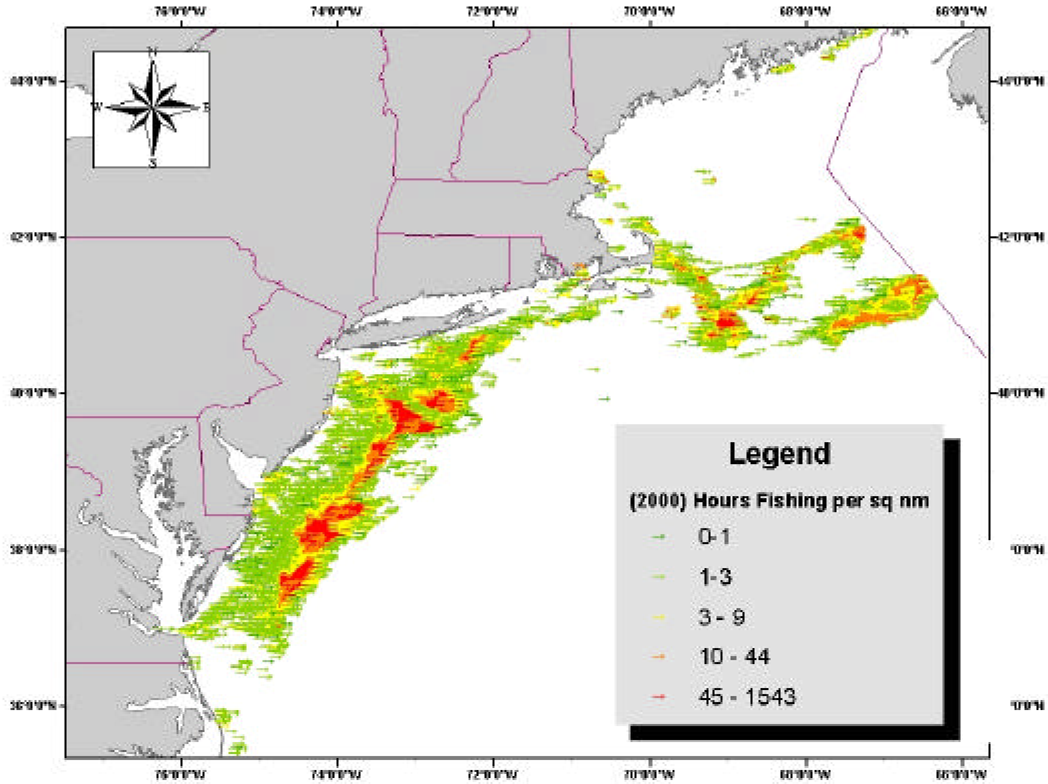


Figure 154 - 2000 Vessel Monitoring System Data for Scallop Fishery

There is some un-published information characterizing habitat conditions inside the year-round closed areas on Georges Bank. There is also growing literature on the benefits of long-term closures to fisheries productivity and habitat complexity related to Marine Protected Areas and Marine Reserves in other marine ecosystems (Woods Hole Oceanographic Institution 2001).

5.3.6.1.3 Seasonal Closed Areas

Like year-round closed areas, the habitat benefits of seasonal closed areas are partially dependent upon the types of gear permitted inside them. Seasonal closed area may offer habitat protection by decreasing the intensity of fishing effort over a longer-term time horizon. However, there is no evidence to suggest that this approach is substantially better for EFH than the habitat impacts faced in the absence of seasonal area closures. The redistribution of effort (both geographically and amongst other fisheries and gear types) combined with potentially greater short-term levels of intensity inside these areas may in fact serve to increase the adverse effects of seasonal area closures on EFH.

Seasonal closures will reduce gear impacts on habitat, but only for short periods of time. The habitat benefits of seasonal closed areas, as for year-round closures, partially depend upon the types of gear permitted inside them (Table 127)**.** Seasonal closures in the Gulf of Maine eliminate fishing effects on benthic habitats for short periods of time, but probably not long enough to provide any significant habitat benefits. The redistribution of effort (both geographically and amongst other fisheries and gear types) caused by these closures, combined with potential short-term increases in fishing effort inside these areas when they are open, may in fact increase the adverse effects of seasonal area closures on EFH. In addition, because of their intermittent protection, seasonal closures offer less opportunity than year-round closures for growth and recovery of benthic communities that may have been altered by fishing activity. The longer the duration of a closure, the more protection it will afford to fish stocks and habitat in that area. The rolling closures currently in existence afford the greatest degree of protection to benthic habitat in inshore regions of the Gulf of Maine, particularly in the waters north of Cape Cod to Cape Ann.

5.3.6.1.4 Total Allowable Catch (TAC)

In a macro sense, the positive impacts of TACs on habitat are mitigated somewhat by the likelihood that once the TAC is achieved, fishing will occur on other (non-TAC) species, or that effort will shift into other fisheries. These changes may or may not have impacts upon EFH similar to the impacts of fishing for the species regulated by the TAC. The impacts upon EFH of targeting different geographic areas or different fisheries as a result of reaching a TAC are unknown.
TACs impact EFH by controlling effort on specific fish stocks. Because these stocks are often found in specific geographic locations or habitats, the benefits to EFH are dependent upon the species being regulated. For example, cod are typically found in areas of proportionally higher bottom complexity, while yellowtail flounder are typically caught in regions with sandy sediments (see Volume II, Affected Environment). Consequently, TACs for cod may protect habitats in geographic regions containing complex bottom-types, while TACs for yellowtail flounder may protect habitats in areas containing sandy sediments.

Potential habitat benefits provided by TACs – like DAS reductions - are derived from reductions in fishing effort. While these benefits are not quantifiable at this time, the single-species nature of the TAC is likely to provide benefits to specific bottom types or geographic areas, as opposed to the more general EFH protection afforded by DAS reductions.

If there are habitat benefits of TACs, they would be somewhat reduced by the likelihood that once the TAC is achieved, fishing will shift to other (non-TAC) species, or into other fisheries. These negative impacts may or may not be equivalent to the positive impacts associated with limiting fishing for the species regulated by the TAC. There is no way of predicting which geographic areas or fisheries might be affected by shifts in fishing effort as species or area-specific TACs are reached.

5.3.6.1.5 Trip and Possession limits

Trip and possession limits have similar impacts on EFH as TACs, in that they limit fishing effort on particular stocks and, consequently, in particular geographic areas or areas of specific bottom sediments. Like TACs, the benefits of possession limits on EFH are directly related to the species being regulated. Trip and possession limits differ subtly, as possession limits prohibit front-loading of the affected species. As costs associated with a fishing trip are relatively unchanged by this management measure, trip limits, in particular, are not likely to reduce bottom contact time for mobile fishing gears as a whole, but rather re-distribute the bottom contact time as fishermen shift from one species to another, during a given trip, once possession limits are reached. For example, while fishing under the expanded Framework 25 haddock trip limit, vessels fishing in the sandy, gravelly areas along the northern border of Closed Area II would often catch their maximum allocation (30,000 lbs of haddock) in the first two or three days of fishing. In order to comply with the 10,000 pounds/day trip limit, these vessels would simply moved north onto the muddier sediments of the Gulf of Maine and target American plaice/witch flounder for the remainder of their 10 day trip.

Possession limits may reduce bottom time in certain geographic areas or on certain sediment types while increasing bottom time on others. The magnitude and direction of this effect depends upon the species being regulated and, more specifically, the characteristics of that species' essential habitats. The aggregate impact of trip/possession limits on habitat is likely to be minimal.

5.3.6.1.6 Gear restrictions/alterations

Gear modifications could refer to any mandated changes to fishing gear . They commonly take the form of minimum mesh size increases, mesh type requirements (i.e. diamond or square mesh), or requirements to include a specific mesh or size in a particular area of the net. Such changes are nearly always made to influence the selectivity and efficiency of the gear, which, by decreasing total catch, may increase fishing time (unless, of course, fishing time is also limited). Other gear modifications (*e.g.*, a raised footrope trawl) can reduce habitat impacts. Modifications that tend to increase bottom contact time for mobile, bottom-tending gear will have negative habitat impacts. Modifications that reduce bottom contact, either by increasing catch efficiency or actually reducing physical contact or disturbance to the sea floor, will have positive habitat impacts.

5.3.6.1.7 Minimum fish sizes

Changes in minimum fish sizes may increase bottom time for mobile fishing gear by increasing the number of tows necessary for a vessel to catch a sufficient quantity of groundfish. The habitat implications of this are not quantifiable, but may be similar to the consequences of small increases in DAS (or any similar measure that increases fishing effort). Simultaneous increases in both minimum fish size and minimum mesh size may increase fishing time and intensity, as it becomes increasingly difficult to reach a trip limit on a target species while avoiding large amounts of bycatch. Any increase in the time gear is in contact with the seafloor will further disturb benthic habitats. It is unlikely, however, that minimum fish sizes will have a direct effect on habitat.

5.3.6.1.8 Summary of Habitat Impacts of Commonly Used Management Tools

Management measures that reduce fishing effort and contact of gear on the bottom will most certainly provide the greatest protection to habitat. Of the measures in place in FY 2001, those most beneficial for habitat protection are limitations on DAS and year-round closed areas. The inshore Gulf of Maine restricted roller gear area is also believed to have had a positive effect on EFH of that region by decreasing effort on high relief bottom types. The four year-round groundfish closures – Closed Area I, Closed Area II, Western Gulf of Maine Closed Area, and Nantucket Lightship Closed Area – most directly benefit benthic habitats by prohibiting the use of most mobile, bottom-tending gear types. Year-round closures also allow for regeneration of benthic communities that are adversely impacted by fishing, as well as the natural recovery of seafloor structure. Seasonal closures may also be beneficial, depending on the time of year when they are in effect, their duration, and the nature of the habitats and the organisms that exist in the closed areas. DAS requirements also limit fishing activity by restricting fishing effort and bottom contact time over the course of each fishing year. However, with the potential for increased utilization of allocated DAS in the fishery, DAS restrictions may provide only limited or negligible benefits to habitat. The benefits of TACs and trip limits on habitat are less clear. While these management tools may reduce fishing in specific areas in which species with TACs or trip limits are commonly caught, they could increase effort in other areas. Mesh restrictions and minimum fish sizes, while improving selectivity of gear and reducing the catch of juveniles and small fish, may prolong fishing time and intensity needed to harvest the TAC/trip limit by decreasing efficiency. Overall, TACs, trip limits, mesh restrictions and minimum fish sizes will likely have little effect, positive or negative, on habitat.

5.3.6.2 No Action Alternative (Not Selected)

Under this alternative, all of the commercial and recreational restrictions that were in place during fishing year 2001 (prior to the *CLF v. Evans* Court order/Settlement agreement) would continue. These measures do not meet the objectives of the M-S Act and are not a reasonable alternative for consideration.

Under this alternative, the management measures in place during fishing year 2001 are maintained. DAS allocations will return to the levels that resulted from the DAS reduction schedule adopted in Amendment 7. Area closures remain the same as contained in Frameworks 27, 31, and 33. The Western GOM Closed Area will be extended until changed by future Council action.

The No Action measures would not be expected to have a direct effect on the habitat of the Gulf of Maine and Georges Bank, with the exception of continuing the protections to habitat incidental to these existing measures. For example, under this alternative the Western Gulf of Maine Closed Area will remain closed until changed by some future Council action. The Western Gulf of Maine Closed Area, although not closed specifically to protect fish habitat, does serve to protect some essential fish habitat (EFH) from potential adverse impacts associated with some types of fishing activities. The indefinite extension of this closed area will ensure that these incidental protections continue until such time that the area closure is changed by a future action.

The No Action Alternative (NAA) is the continuation of measures in place during the 2001 fishing year. The existing management measures, although not implemented specifically to protect habitat, do provide some habitat benefits. This section will assess those benefits. In the multispecies fishery, a suite of seven management tools is utilized in various combinations within the alternatives designed to meet rebuilding objectives. The impacts of these tools on EFH are discussed both in general terms and as they relate specifically to management measures in place during FY 2001.

5.3.6.2.1 Year-Round Closures Under the No Action Alternative

Under the NAA, Closed Area I (CA I), Closed Area II (CA II), Nantucket Lightship Closed Area (NLCA) and the Western Gulf of Maine closed area (WGOM) will remain year-round closures, unless, or until, they are modified for resource management purposes. The three closures on Georges Bank and in southern New England were established in December 1994. The WGOM closure was established in May 1998. About 20% of the Georges Bank closed areas were temporarily opened to scallop dredging in 1999 and 2000.

These areas add up to 5,847 nmi², and are made up primarily of sandy substrates, but also contain fairly high proportions of the gravel and gravelly sand substrates in the Northwest Atlantic Analysis Area (NWA). It is reasonable to assume that these closures have increased the quality of benthic habitats within the closures during the last 5-8 years.

5.3.6.2.2 Seasonal Closures Under the No Action Alternative

Existing groundfish management measures also include rolling seasonal closures, which close a series of fairly large areas in the Gulf of Maine for a month or two at time. These closures are designed to reduce fishing mortality on cod by prohibiting trawling on spawning and pre-spawning aggregations. The Council will continue the backstop provision that additional closures will be implemented if 50% of the GOM cod target TAC (based on the average between the $F_{0.1}$ target TAC and the F_{max} target TAC) is landed by July 31 (with a fishing year beginning May 1). If the contingency is met and the backstop measures are triggered, the Cashes Ledge Closed Area will remain closed for one additional month

(November) and Blocks 124 and 125 (inshore Gulf of Maine between Cape Ann and Cape Cod) will close in January.

5.3.6.2.3 Day-at-Sea Usage Under the No Action Alternative

The NAA will maintain the annual day-at-sea allocations initiated in Amendment 7 (1996). The Amendment 7 effort reduction program resulted in the allocation of 88 DAS per fishing year to Fleet DAS vessels. Table 133 provides a complete summary of DAS usage by multispecies vessels from 1995 to 2001 (2002 data is reported but incomplete). DAS allocations increased steeply from 1995 to 1996 because of the implementation of new limited access permit categories in Amendment 7 (1996) which increased the number of vessels requiring the use of a day-at-sea to fish for groundfish. From 1996 to 1997, the number of allocated DAS in the groundfish fishery decreased substantially as a result of the effort reduction program established in Amendment 7. From 1997 to 2001, the number of total DAS allocated to permitted multispecies vessels and the fraction of the total allocation afforded to active vessels with documented DAS use (according to call-in records) remained relatively stable. The number of DAS used by multispecies vessels, however, has increased steadily since 1997 (Figure 155). With so many unused groundfish DAS allocated to groundfish vessels and evidence that a smaller fraction of the total allocated DAS are remaining latent, there is great potential for expansion of effort in the groundfish fishery. An allocation of 88 days per vessel accompanied by no additional effort reduction measures will most likely lead to increased fishing effort. Expansions in fishing activity will have consequences for the benthic habitat depending on how effort is increased and where it is concentrated.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	Total Number of Permitted Vessels with Allocated DAS	Total Days-at-Sea Allocated	Number of Permitted Vessels that Called In	DAS Allocated to Vessels that Called In	Total DAS Used by Vessels that Called In	% of total allocated DAS Used by Permitted Vessels that called in ((5)/(2)*100)	% of allocated DAS (to vessels that called in) Used by Permitted Vessels that Called In ((5)/(4)*100)
1995	769	140,956	440	83,695	38,527	27	46
1996	1,705	236,218	990	140,612	51,968	22	37
1997	1,713	155,270	1,090	101,905	49,464	32	49
1998	1,636	156,989	1,062	106,415	52,935	34	50
1999	1,646	160,452	1,067	106,506	54,271	34	51
2000	1,649	160,720	1,082	109,757	61,290	38	56
2001	1,588	156,290	1,096	111,572	65,275	42	59
2002*	1,353	69,266	805	52,594	13,517	20	26

Table 133 - Summary of DAS Use, 1995-2002
2002 data are current through 9/16/02
Shaded cells are not comparable to previous years.
This table includes data from multispecies/monkfish DAS trips (in which the multispecies and monkfish clocks run concurrently).
DAS totals include any adjusted gillnet DAS totals.
Data Source: NMFS Enforcement DAS Call-In Database, NMFS Permit Database

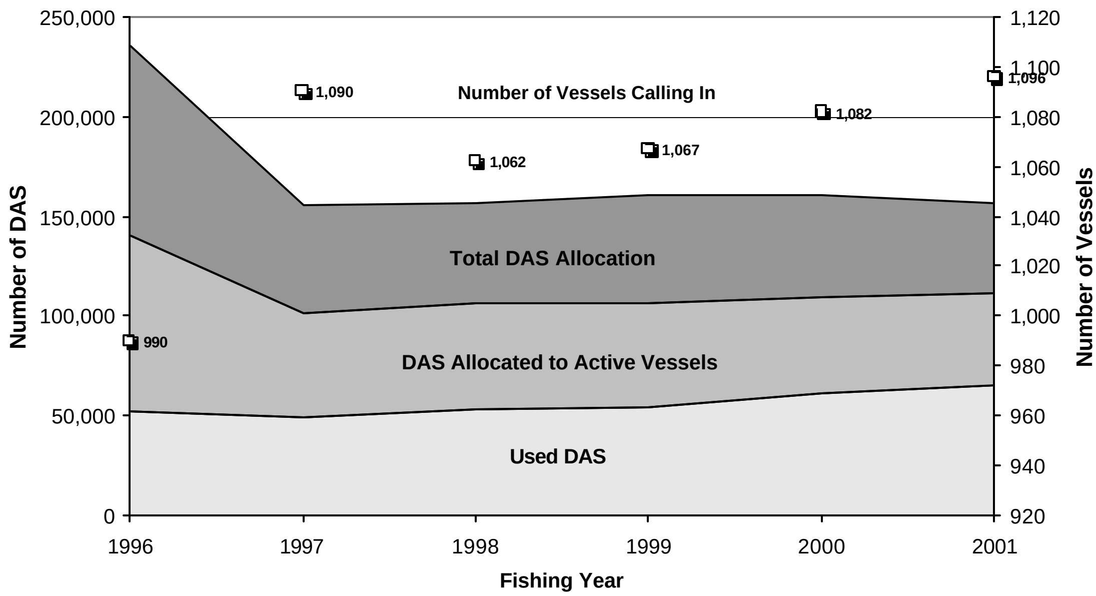


Figure 155 - Summary of DAS Use in the Groundfish Fishery, 1996-2001
This table includes data from multispecies/monkfish DAS trips (in which the multispecies and monkfish clocks run concurrently).
DAS totals include any adjusted gillnet DAS totals.
Data Source: NMFS Enforcement DAS Call-In Database, NMFS Permit Database

5.3.6.2.4 TACs Under the No Action Alternative

Target TACs for groundfish species will remain as they were in FY 2001.

5.3.6.2.5 Trip and Possession Limits Under the No Action Alternative

Trip limits remain the same as in Framework 33: 400 lbs./day with a maximum possession limit equal to ten times the daily limit (i.e. 4,000 pounds) for GOM cod. Vessels may land a limited overage of cod as follows:

Vessels not enrolled in the Gulf of Maine Cod Trip Limit Exemption Program are limited to 400 pounds for each day or part of a day on the trip. On trips under 24 hours a vessel may not land more than 400 pounds of cod, and may not land cod again until 24 hours have elapsed from the start of the trip, although the vessel may call-out of the DAS program before 24 hours have elapsed. On trips longer than 24 hours, a vessel may land 400 pounds of cod for each full day (24 hours) of the trip and 400 pounds for any part of a 24-hour period, provided it does not call out of the DAS program until the remainder of that 24-hour period has elapsed. A vessel on a trip longer than 24 hours and landing up to 400 pounds of cod for any part of a (24-hour) day may not leave port or call out of the DAS program for the remaining part of the 24 hours.

A vessel may not land more than 4,000 pounds, even if the trip duration exceeds ten days.

Trip limits for GB cod remain the same as implemented through Framework 33: 2,000 pounds per DAS, or part of a DAS, with a maximum possession limit equal to ten times the daily limit (20,000 pounds). There are no trip limits for other key stocks.

5.3.6.2.6 Gear Restrictions Under the No Action Alternative

Under the NAA, there are no revisions to gear requirements adopted in Amendment 7 and subsequent frameworks. Few of these gear restrictions or modifications have had a direct effect on habitat since they have focused to a great extent on improving mesh selectivity and minimizing the catch of juveniles and non-target species. Vessels in the GOM/GB regulated mesh area must use either 6 inch diamond or 6.5 inch square mesh trawl cod ends, and 6 inch or 6.5 inch gillnets. Gillnet vessels are restricted to 80 stand-up nets or 160 tie-down nets; day gillnet vessels must tag nets. Trawl vessels are limited to 12-inch roller gear in the inshore GOM.

5.3.6.2.7 Minimum Fish Sizes Under the No Action Alternative

The minimum sizes for commercially caught groundfish species are:

Cod	19 (48.3 cm)
Haddock	19 (48.3 cm)
Pollock	19 (48.3 cm)
Witch flounder (grey sole)	14 (35.6 cm)
Yellowtail flounder	13 (33.0 cm)
Atlantic halibut	36 (91.4 cm)
American plaice (dab)	14 (35.6 cm)
Winter flounder (blackback)	12 (30.5 cm)
Redfish	9 (22.9 cm)

5.3.6.3 Alternative 1 – Up to a 65% reduction in used days-at-sea (Not Selected)

Commercial Measures

--Reduces used DAS by up to 65% (from the average number of days used in the 2000 and 2001 fishing year), and controls unused DAS. The exact reduction depends in part on the choice of rebuilding strategy.

--Vessels fishing in the Southern New England or Mid-Atlantic Regulated Mesh Areas from December through April would be charged DAS at a rate of 1.5 days for each day fished. Southern New England yellowtail flounder and Cape Cod/Gulf of Maine yellowtail flounder would be under a seasonal trip limit.

--Current rolling closures, year-round closures, trip limits other than yellowtail flounder, minimum fish sizes, implemented August 1, 2002 are continued. Additional gear restrictions would be adopted.

Habitat Impacts

This alternative adopts all of the management measures put in place as a result of a settlement agreement among certain parties in *Conservation Law Foundation et al. v. Donald Evans et al.* (hereafter referred to as the Settlement Agreement). Included is a 20% reduction in DAS, the elimination of unused (latent) DAS, an increase in the minimum size for cod from 19 to 22 inches, and the closing of Cashes Ledge Closure Area year-round.

Alternative 1 focuses on a reduction in total DAS to 21,700 days. By comparison, 53,500 DAS were utilized in FY 1999. This substantial reduction in DAS will reduce bottom contact time by mobile groundfish gears significantly. The impacts of DAS reductions discussed previously are likely to be mitigated somewhat more substantially with such large reductions in available groundfish fishing DAS—fishermen will be forced to make up for the lost revenue in other fisheries, which may or may not have equivalent impacts on habitat. It is possible that the overall time spent fishing with mobile, bottom tending gears may increase as vessels switch to other fisheries, fish inside state waters, etc.

Closing the Cashes Ledge area year-round to all gear capable of catching groundfish imparts the same level of habitat protection to this area as is afforded to the western Gulf of Maine Closed Area. Cashes Ledge Closed Area includes a complex substrate consisting of mud, gravelly sand, and bedrock. This area contains EFH for 19 species in their juvenile life stage and 21 species in the adult life stages.

The benefits of this addition to the year-round closed areas are summarized in the tables below. Note that because no sediment categorized as bedrock was protected under the No Action alternative, it is not possible to calculate the percentage increase of bedrock under the new year-round closed areas. The total amount of bedrock in the Northwest Atlantic analysis area is 27.2 sq nautical miles; none of it is protected under the No Action alternative, but 15.2 sq nautical miles would be protected under Rebuilding Alternative 1.

Species	**Black sea bass**	**Bluefish**	**Butterfish**	**Cod**	**Dogfish**	**Haddock**	**Halibut**	**Herring (egg)**	**Longfin squid**	**Mackerel**	**Monkfish**	**American plaice**	**Pollock**	**Ocean Pout**	**Quahog**	**Redfish**	**Red hake**	**Scallop**	**Scup**
% change from No Action	0.00%	--	0.04%	3.08%	--	7.53%	5.53%	0.04%	0.54%	3.85%	16.79%	28.05%	8.66%	10.54%	0.00%	23.03%	7.39%	0.01%	0.00%
Species	**Shortfin squid**	**Barndoor skate**	**Clearnose skate**	**Little skate**	**Rosette skate**	**Smooth skate**	**Thorny skate**	**Winter skate**	**Summer flounder**	**Surf clam**	**Tilefish**	**White hake**	**Whiting**	**Windowpane fl.**	**Winter flounder**	**Witch flounder**	**Yellowtail flounder**	**Offshore hake**	**Red crab**
% change from No Action	0.88%	0.17%	1.41%	0.26%	--	20.42%	11.95%	1.11%	--	0.00%	--	13.85%	8.83%	0.03%	0.03%	89.37%	0.03%	--	--

Table 134 - Rebuilding Alternative 1: Change in total amount of designated EFH encompassed by year-round closed areas.

See Affected Biological Environment for further details on EFH.

Mesh size increases for trawl net cod ends/gillnets and limits on the number of hooks allowed for longline vessels, put in place by the Settlement Agreement, are continued under this alternative. See Gear Restrictions, above, for potential impacts. There are no significant impacts from these seasonal closures.

A possession limit of 500 lbs/day / 4,000 lbs/trip for both GOM and GB cod is proposed. This limit is much more stringent for cod caught on Georges Bank than the No Action Alternative or the Settlement Agreement. This possession limit may reduce fishing effort on the gravel, gravelly sand and muddy sand substrates found in the northern portions of Georges Bank and along Nantucket Shoals where cod are typically found (see Figure 156).

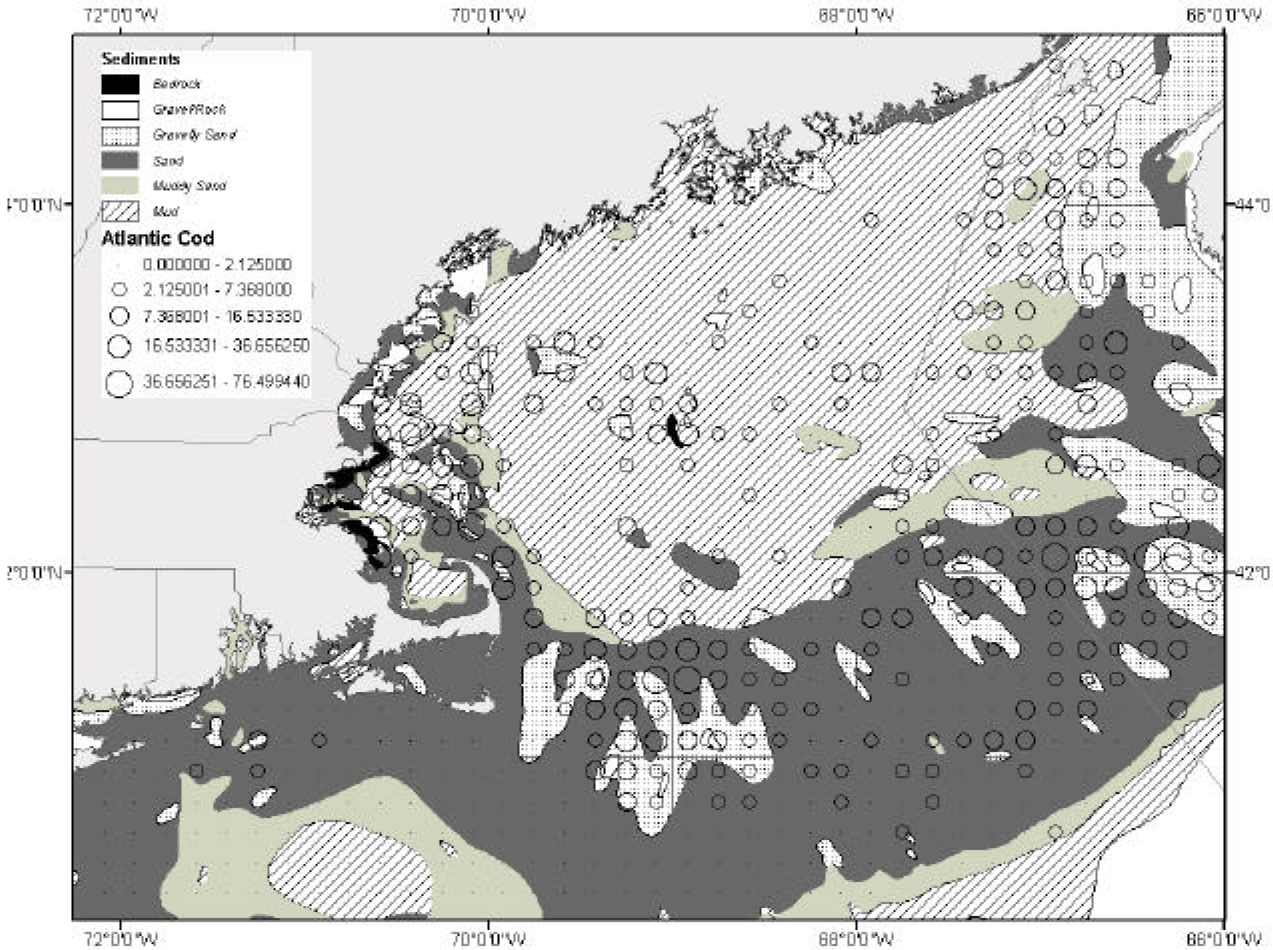


Figure 156 - Mean weight per tow of Atlantic Cod (1995-2001 trawl surveys) with sediment types of the Northwest Atlantic (modified from original map by Poppe *et al.* 1989).

5.3.6.4 Alternative 2 - Reduction of allocated DAS/gear modifications (Not Selected)

Commercial Measures

--Maintain the DAS allocations adopted August 1, 2002, except in the Gulf of Maine, where additional DAS restrictions would apply.

--Maintain rolling closures and year round closures implemented August 1, 2002.

--Maintain the GOM cod trip limit adopted August 1, 2002, and the Georges Bank cod trip limit would be reduced to match the current Gulf of Maine cod trip limit.

--Cape Cod yellowtail flounder would be under a low trip limit in the southern portion of the inshore Gulf of Maine and east of Cape Cod.

--Southern New England yellowtail flounder and Cape Cod/Gulf of Maine yellowtail flounder would be under a seasonal trip limit.

--Additional gear restrictions (the use of flounder net, separator trawl, or raised footrope required in many portions of the Gulf of Maine and Georges Bank).

Habitat Impacts

This alternative utilizes the same year-round closed areas and minimum fish sizes as the No Action Alternative. There are provisions for increased Seasonal Closed Area coverage in the northern sections of the Gulf of Maine. Gear restriction provisions call for the mandatory use of haddock separator nets and/or a flounder net for trawl vessels fishing in the Georges Bank RMA or inshore of 70 degrees west longitude.

There is an important provision for a raised footrope trawl in 30-minute square blocks 114, 115, 123, 124 and 125. A raised footrope trawl reduces the adverse impacts of otter trawl gear on the sea floor (see Gear Effects Evaluation). The area covered by this provision consists primarily of sandy, muddy sand and mud substrate, with small amounts of gravelly sand and bedrock (Figure 157). This area contains designated EFH for 31 juvenile species and 30 adult species.

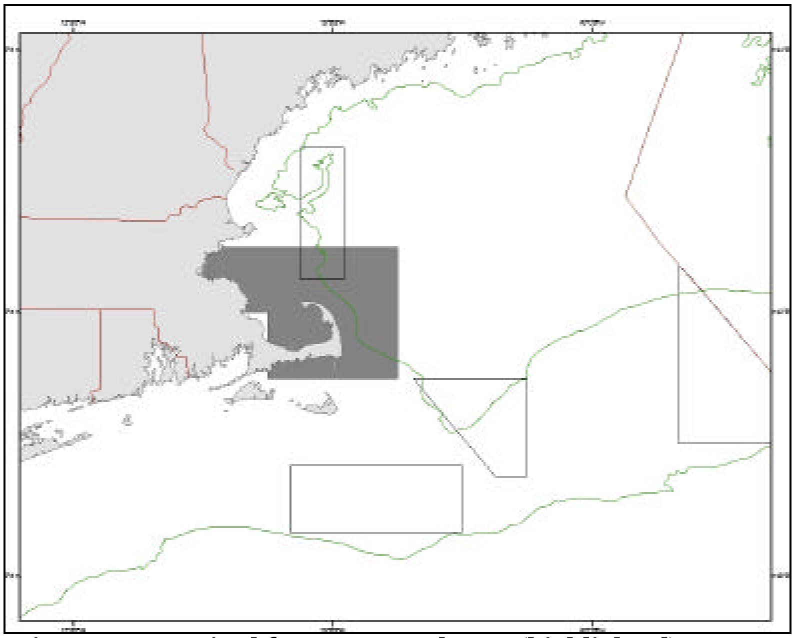


Figure 157 - Raised footrope trawl area (highlighted).

A Georges Bank Yellowtail Flounder Access Program is included in this alternative.

5.3.6.5 Alternative 3 - Area management (Not Selected)

Commercial Measures

--Establishes structure to develop rules for particular geographic areas that are consistent with the type of fishing that occurs in a particular area. This alternative is meant to encourage a sense of stewardship by vessels fishing in a particular area by increasing their involvement in the development of management measures.

--Measures implemented August 1, 2002 will remain in effect until area-specific commercial and recreational measures are developed through a series of meetings and implemented by NMFS.

--Proposes the following 5 management areas: inshore Gulf of Maine (divided into east and west), offshore Gulf of Maine, western Georges Bank, eastern Georges Bank, and Southern New England/Mid Atlantic.
--Establishes total allowable catch (TAC) for each species in each area. There are three options for how the fishery would operate:
--Implement a "hard" TAC. A 'hard' TAC means that when the amount of fish equal to the specified TAC has been caught, the fishery for that particular species closes. Only gears types that have been approved by the NMFS would be allowed to continue fishing for other available groundfish stocks (those stocks where the harvest had not yet reached an amount equal to the TAC).
--Implement a "soft" TAC. A 'soft' TAC means that if the amount of fish caught equals the TAC, the fishery does not automatically shut down. However, under this option, when 80% of the TAC is caught other management measures go into place to slow down the catch rate.
--Allocate up to 60% of the TAC to the directed fishery for a stock, and reserve the remainder of the catch for fisheries that targeted another species. If the amount of fish caught in a particular year exceeded the TAC, the TAC the following year would be reduced.
--Options on where a particular vessel may fish. One option restricts a vessel to fishing in only one management area over the course of a fishing year. Another option allows a vessel to fish in any area on a trip, but for all areas fished the vessel would have to abide by the most restrictive rules (among the areas fished).

Habitat Impacts
This alternative divides species-specific TACs amongst different management areas that divide varying portions of the GB/GOM RMA into management areas. Six options, each comprised of five management areas, are considered. The primary difference among these six options is the boundaries for areas on Georges Bank.

Like Rebuilding Alternative 1, all management measures put in place by the Settlement Agreement, including the year-round closed areas and DAS reductions, are employed here as well. No further changes to these measures (beyond the TACs) are proposed.

The various options for controlling movement of fishing vessels between management areas (there are five such options) may have unpredictable effects on the geographic stability of the fleet. For example, vessels may chose to fish certain areas more exclusively than they had under other management regimes. Two options require vessels to declare at the beginning of the fishing year those management areas they intend to fish in. This requirement may lead to unanticipated (and undesired) increases in geographically specific fishing efforts as aggregations of vessels to continue fishing in areas that they would not otherwise target. It is impossible to quantify the habitat impacts of such situations; they depend largely on the bottom composition and species richness of the affected area, and on the specific gears utilized.

5.3.6.6 Alternative 4 - 'Hard' total allowable catch (Not Selected)

Commercial Measures
--Implements a 'hard' TAC system. A 'hard' total allowable catch means that when the amount of fish equal to the TAC (catch quota) has been caught, the fishery for that particular species shuts down – either by prohibiting fishing in a stock area with gear capable of catching that species, or by prohibiting possession of that species. A separate total allowable catch may be set for each of the stocks managed under the fishery management plan, or for stocks that are in relatively good condition, an aggregate total allowable catch may be set (one quota set for several stocks of fish combined).

--If the recreational fishery represents a significant portion of the total catch, then a recreational total allowable catch may be specified.
--An option under this alternative is to set only 'target' total allowable catches for incidental fisheries. In other words, a maximum amount that may be caught incidentally would be specified, but when the actual incidental catch equals the total allowable incidental catch, the fishery does not automatically shut down. The total allowable catch may be divided into 4 month allotments, or up to 60% of the total allowable catch would be allocated to the directed fishery for a stock, and the remainder of the catch would be reserved for fisheries that target another species.
--As the TAC is approached, a restrictive trip limit is imposed to slow the catch rate. These trip limits may be implemented at either 70 percent or 90 percent of the TAC.

Habitat Impacts
TACs will be applied to all stocks in the multispecies FMP on a single or multi-stock basis. All management measures resulting from the Settlement Agreement, including area closures and DAS restrictions, will remain in place.

Without quantitative predictions of TAC levels and species affected, it is not possible to expand on the habitat impacts of this alternative at this time. The impacts of other management measures are described in the analysis of Rebuilding Alternative 1.

5.3.6.7 Proposed Action

See Section 3.6.1 for the details of the proposed measures for the commercial fishery, and Section 3.6.2 for the details of the proposed measures for the recreational fishery. In general, this proposal adopts management measures to achieve a mix of adaptive and phased reduction rebuilding strategies. In addition, it develops opportunities for fishing on stocks that do not need reductions in fishing mortality. The table below highlights the habitat impacts of this proposed action.

Amendment 13 contains a wide variety of management measures and it the largest and most comprehensive amendment to the Northeast Multispecies FMP since Amendment 9. As such, the changes to the FMP are widespread. The proposed measure has varying impacts on essential fish habitat (EFH) (Table 135). Many of these changes are benign for Essential Fish Habitat (e.g. clarifications of stock status, status determination criteria, and MSY control rules), some new management measures have additional negative impacts on EFH (e.g. US/Canada Resource Sharing Program) while still others perpetuate the negative impacts on EFH under the Status Quo. An example of this can be found under the Closed Area Administration program that allows bottom tending mobile gears to continue to operate in complex habitats (e.g. shrimp trawls in the Western Gulf of Maine Closure). With this in mind, however, the overall or net impact to EFH is positive. This results from the substantial positive impacts from the management measures to address the FMP's management unit's rebuilding requirements through significant effort reductions (DAS), the elimination or restriction of latent effort as potential adverse effects and the retention of the current groundfish closed areas. Habitat Alternative 2 was intended to capture these positive benefits to EFH through the use of the fishery's own need to reduce effort, modify gears and close important areas to groundfish fishing. The net result of these measures to EFH is positive. Additionally, Amendment 13 also proposes other measures developed to directly benefit EFH by minimizing, to the extent practicable, the adverse effects of fishing on EFH (Table 136).

Alternative	Overall Habitat Impact	Feature	Description of Essential Fish Habitat Impact
Clarification of Stock Status, Status Determination Criteria and MSY Control Rules	Neutral Impact (O)	Includes definitions of when a stock is overfished, when overfishing is occurring, status determination criteria, and MSY control rules	No Impact
Proposed Rebuilding Programs for Overfished Stocks	Neutral Impact (0)	Defines the rebuilding timelines and trajectories	No direct impact, but a shorter time frame would reduce effort, thus having positive impacts on adversely effected EFH.
Ending Overfishing	Neutral Impact (0)	Defines the management plan for overfished stocks.	No Impact.
Fishery Program Administration	Negative Impact (-)		Negative overall EFH impact because of closed area access by bottom tending mobile gear.
Fishing Year	Neutral Impact (0)	No Action-Fishing year starts on May 1	Neutral habitat impacts because it doesn't directly affect the frequency or intensity with which the fishery is prosecuted.
Periodic Adjustment Process	Neutral Impact (0)	Biennial adjustment	Neutral impact, but this will allow the effect of regulations on EFH to be better assessed.
US/Canada Resource Sharing Agreement	Negative Impact (-)	Specifies an allocation of cod, haddock, and yellowtail flounder for each country in area 5Zjm (eastern Georges Bank) with incentives for participation and subject to catch limits	A small area at the top of CAII will be opened to bottom trawling for 10 months a year: habitat impacts in this area will be negative.
Bycatch/Exempted Fisheries	Neutral Impact (0)	Allows changes to standards for certified bycatch/exempted fisheries	The impact is neutral, however, it could be negative if bottom tending mobile gear are permitted in closed areas or positive if additional gears that adversely impact benthic habitats are prohibited.

Table 135 - Potential habitat impacts of non-habitat Amendment 13 management alternatives

Note: Seasonal (rolling) closures, possession limits, and hard TACs that are included in a number of proposed management measures are not considered to provide any significant habitat benefits. Habitat benefits identified above apply primarily to bottom trawls, not to fixed gear such as hooks and gill nets.

Alternative	Overall Habitat Impact	Feature	Description of Essential Fish Habitat Impact
Special Access Programs	Neutral for GB yellowtail. Neutral for SNE winter flounder. Negative for US/Canada SAP.	Provides access to limited, specific regulated fisheries; four SAPs approved for GB Yellowtail, GB haddock, SNE Winter flounder, and US/Canada Sharing Agreement	Neutral impact for GB program because this area is primarily composed of sandy bottom and is less susceptible to the adverse effects of fishing than the gravel bottom area in the northern portion of the closed area. Also, the fact that this area was heavily fished during the CAII access program during 1999-2001 means that any additional habitat impacts associated with trawling for yellowtail are likely to be minimal. Neutral impact from SNE winter flounder access program. CA I program limited to hook gear, with no impact on bottom habitat See above for impacts of US/Canada Sharing Agreement.
Closed Area Administration	Negative Impact (-)	Various options would allow access of currently exempted gear into Georges Bank closed areas, provided no retention of multispecies	There will be negative impact on adversely effected EFH by allowing access for gears such as shrimp trawls (in NLCA, CAI, and CAII) and clam dredges (in NLCA).
DAS Leasing	Neutral Impact (0)		This alternative enhances the economic viability for the fishery and is not expected to have impacts on EFH.
Recreational Fishing Permit	Neutral Impact (0)	No Action-no permit required	Most recreational fishing gear does not have an adverse effect on EFH.
Running Clock	Neutral Impact (0)	No Action-modified running clock will remain in effect	This measure will not likely increase effort beyond the No Action.
Observer Coverage	Indirect benefits (+)	10% requested by 2006 for each gear type, unless NMFS determines other level	If observers are able to collect data of interest to EFH management, increased coverage could indirectly benefit habitat.
VMS Requirements	Neutral Impact (0)	Vessel can sign out of VMS program when not fishing	This is an administrative measure and will not impact EFH.
Day Gillnet Block		No Action-gillnet vessels must take 21-day block out btwn. June and September	

Table 135 - Potential habitat impacts of non-habitat Amendment 13 management alternatives

Alternative	Overall Habitat Impact	Feature	Description of Essential Fish Habitat Impact
DAS Counting	Neutral Impact (0)	No Action-DAS counted by hour and minute; gillnet charged min of 15 hours.	DAS is counted the same as under the No Action, so this measure will not impact EFH.
Reporting Requirements	Neutral Impact (0)	Daily electronic dealer reporting and use of trip identifier to link vessel and dealer reports	Same as No Action. Increased VMS would provide more knowledge of fishing intensity by area and habitat type.
Sector Allocation	Neutral Impact (0)	Approval of sector allocation proposal brought to NMFS through Council. Sector decides about movement between sectors. Allocation based on documented catch. Hard TACs by species.	As a management measure, sector allocation is not expected to have any significant habitat impacts.
GB hook/gillnet sector	Neutral Impact (0)	Approval of hook sector	This sector allocation program is not expected to have any significant habitat impacts, especially since hook gear has been deemed not to have adverse impacts on EFH.
Alternatives to Control Capacity	Positive Impact (+)	DAS can be transferred with restrictions and new measures for "reserve days"	Any measure that is intended to reduce the amount of time fishing by bottom-tending mobile gear will likely have benefits to EFH. These measures reduce amount of latent effort as well.
Management Measures to Address Rebuilding Requirements	Overall Positive Impact (+)	Mix of adaptive and phased reduction strategies. Provides opportunity to fish on stocks that do not need rebuilding	The effort reductions, year-round closed areas, and existing gear modifications are likely to have large positive impacts on EFH.
Effort Controls	Positive Impact (+)	A days (60% of effective effort) B days (40% of effective effort) C days (FY01 allocation)	Reducing DAS will benefit EFH by reducing the amount of time vessels can fish. Benefits will vary by area, gear, and habitat type, and will be higher in sensitive habitat areas (e.g., hard bottom) where bottom trawls and scallop dredges are currently being used.
Re-classification of DAS	Neutral Impact (0)	B days can becomes A days if stocks recover	Effort can shift to stocks that can support additional fishing, but overall fishing effort allocated does not change, so habitat impacts are neutral.

Table 135 - Potential habitat impacts of non-habitat Amendment 13 management alternatives (cont.)

Alternative	Overall Habitat Impact	Feature	Description of Essential Fish Habitat Impact
Management Measures	Positive (+)	Same as settlement agreement unless specified	Overall the measures are beneficial to EFH, especially the extensive effort reduction measure applicable largely to bottom tending mobile gear.
Closed Areas	Positive Impact (+)	Maintains existing groundfish closures and add Cashes Ledge as a year round closure.	Year-round closures provide habitat benefits to the areas within the closures. The addition of Cashes Ledge as a year-round closure will benefit the EFH and rare kelp beds found in that area.
Possession Limits	Neutral Impact (0)		Possession limits may reduce bottom time in certain geographic areas or on certain sediment types while increasing bottom time on others. The magnitude and direction of this effect depend upon the species being regulated and, more specifically, the characteristics of that species' essential habitats.
Gear Restrictions	Neutral Impact (0)	Additional changes and restrictions on gillnets	Neutral impacts on EFH because these modifications are specific to gillnet gear, which does not have adverse impacts on EFH.
Minimum fish sizes	Neutral Impact (0)	Same as settlement agreement	Overall, neutral impact on EFH, but increases in minimum fish sizes may indirectly cause bottom contact time to increase by increasing the number of tows necessary for a vessel to catch a sufficient quantity of groundfish. Any increase in the time that gear is in contact with the seafloor will further disturb benthic habitats.
Other Issues			
Area Restriction of the Northern Shrimp fishery	Neutral Impact (0)	Eliminate area restriction	Little impact on essential fish habitat is expected, as otter trawling for groundfish is common in areas commonly fished for shrimp outside the Exemption Area. Furthermore, shrimp gear is more limited in the type of bottom it can be towed over as it is generally smaller with lighter ground gear.

Table 135 - Potential habitat impacts of non-habitat Amendment 13 management alternatives (cont.)

Alternative	Overall Habitat Impact	Feature	Description of Essential Fish Habitat Impact
Tuna Purse Seine Access	Neutral Impact (0)	Permits access in all groundfish closed areas	This gear type has not been identified as a gear type that has adverse impacts on EFH.
SNE General Category Scallop Exemption Program	Neutral Impact (0)	Allow access to an exemption area in southern New England for vessels that are declared out of the DAS program.	Based on the relatively small amounts of scallops available inside the exempted area and this area's sedimentary makeup (mostly sand), no significant negative impacts to EFH are anticipated. Additionally, bottom habitats in this area are currently subject to disturbance by bottom trawls.

Table 135 - Potential habitat impacts of non-habitat Amendment 13 management alternatives (cont.)

Habitat Alternative	Overall Habitat Impact	Feature	Description of Essential Fish Habitat Impact
Alternative 2	Positive Impact (+)	Benefits of other measures implemented in A13	Several measures that are being implemented in A13 were not intended to minimize adverse effect of fishing on EFH, but they will have complementary habitat benefits.
Alternative 7	Positive Impact (+)	Prohibition of clam dredges in year round closed areas	Hydraulic clam dredges have been demonstrated to cause an adverse impact to EFH (see Gear Effects Evaluation section). Prohibiting this gear will benefit the EFH of species found within the section of the NLCA (NW corner) where this fishery is prosecuted.
Alternative 10b	Positive Impact (+)	Closed areas to minimize impacts on EFH	Year round closures have beneficial impacts on adversely effected EFH, and many of these areas are considered important habitat areas with complex bottom or high EFH value.

Table 136 - Description of alternatives to minimize the adverse effects of fishing on essential fish habitat as proposed in Amendment 13.

5.3.6.8 Recreational Measures

Three were three options considered for the recreational sector (private recreational and charter/party). These options apply to any of the Alternatives that address rebuilding requirements. The Council proposes to implement a minimum fish size requirements, possession limits and all other measures in place during FY2001. See Section 3.6.2 for a complete description of the measures being proposed for the recreations sector.

Habitat Impacts

Recreational fishin g, primarily through hook and line or harpoon, has no significant impact on habitat.

5.3.6.9 Summary of Habitat Impacts of Measures to Achieve Rebuilding Objectives

Table 137 summarizes anticipated impacts of the stand-alone Amendment 13 Stock Rebuilding Alternatives. A score of "-1" indicates a reduction from the levels of protection afforded by the No Action Alternative. A score of "0" indicates no change, a score of "+1" indicates an increased level of protection commensurate with the Settlement Agreement and a score of "+2" indicates a level of protection beyond that of the Settlement Agreement. The No Action Alternative would receive scores of "0" in all rows. Anticipated habitat impacts in some cases depend on which option is selected for an alternative.

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Proposed Action
Days-at-sea reductions	+2	+2	+1	+1	+2
Year-round closed areas	+1	+1	+1	+1	+1
Seasonal closed areas	0	0	0	0	0
TAC	0	0	0	0	0
Trip/possession limits	+2	+1	+1	+1	+2
Gear restrictions	+2	+2	+1	+1	+2
Minimum fish sizes	0	0	0	0	0
Closed area access plan	0	0	0	0	0
SUM	7	6	4	4	7
RANK	1*	2	3*	3*	1*

Table 137 - Qualitative summary of habitat impacts of stand-alone rebuilding objective alternatives
** indicates tied ranking*

5.3.7 Other Issues

5.3.7.1 Northern Shrimp Fishery Exemption Area (Selected)

The Council selected to expand the geographic area of the Northern Shrimp Fishery Exemption Area (Option 2).

Habitat Impacts
Option 1
There are no significant habitat impacts associated with this option.

Option 2 - Eliminate Area Restriction for the Northern Shrimp Fishery

Little impact on essential fish habitat is expected, as otter trawling for groundfish is common in areas commonly fished for shrimp outside the Exemption Area. Furthermore, shrimp gear is more limited in the type of bottom it can be towed over as it is generally smaller with lighter ground gear. Shrimp trawls also have shorter legs and are towed at only about 2 knots. Thus with lighter, smaller ground gear, shrimp trawls will impact the bottom less than groundfish gear and will be fished in less varied, less rugged terrain. When concentrations of shrimp occur offshore, they are most likely to be located in the general vicinity of the Cashes Ledge Closure Area.

5.3.7.2 Tuna Purse Seine Access to Closed Areas (Selected)

This alternative proposed to change the current regulations regarding access to closed areas in order to allow the use of tuna purse seines in Nantucket Lightship Closed Area, Closed Area I, and Closed Area II. The options within this alternative vary with respect to the number of restrictions that would be associated with access to these closed areas, the Council selected Option 2.

Habitat Impacts
Option 1 – Status Quo
This option does not propose any changes to the current prohibitions on access of tuna purse seine vessels to the groundfish closed areas. They would continue to be excluded from Closed Areas I and II and the Nantucket Lightship Closed Area and would continue to have access to the Western Gulf of Maine Closed Area, the Cashes Ledge Closed Area and the seasonal rolling closures. Because this option maintains the status quo, there would be no increase or change to the amount or distribution of adverse impacts to habitat associated with the tuna purse seine fishery.

Option 2 -- Access with Restrictions
This option proposes to change the current restrictions on the tuna purse seine fishery to allow access, subject to certain restrictions, to the groundfish closed areas from which the fishery is currently excluded. The restrictions proposed are intended to prevent any potential adverse impacts to habitat that may result from the use of tuna purse seines in areas otherwise closed to most types of fishing activity. The restrictions include a prohibition on the tuna purse seine fishery operating in any area designated as an HAPC. Based on the restrictions proposed, this option would not be expected to have any adverse impacts to the habitat of the region compared to the level of impacts that may currently be associated with this fishery.

Option 3 -- Access without Restrictions
This option proposes to change the current restrictions on the tuna purse seine fishery to allow access, subject to certain restrictions, to the groundfish closed areas from which the fishery is currently excluded. This option proposes less restrictive conditions on the fishery than the previous option (for example, this option prohibits the fishery from operating in the HAPC on Georges Bank within Closed Area II but the previous option would prohibit the fishery from operating in any HAPC). Because the conditions are less restrictive than the previous option, this option could increase the amount of adverse impacts to habitat that may be associated with the tuna purse seine fishery.

5.3.7.3 Southern New England General Category Scallop Exemption Program (Selected)

The Council selected to allow access to an exemption area in southern New England to fish for scallops for the following types of vessels: limited access scallop vessels that are declared out of the DAS program, limited access scallop vessels that have used all their DAS, or general category scallop vessels.

Vessels would be allowed to fish in this area while not under a multispecies day-at-sea as long as they comply with several restrictions.

Habitat Impacts
This alternative allows scallop dredge vessels to fish in a specified area (Figure 158) for scallops outside of the DAS program providing they employ dredges of not longer than 10.5 ft (combined).

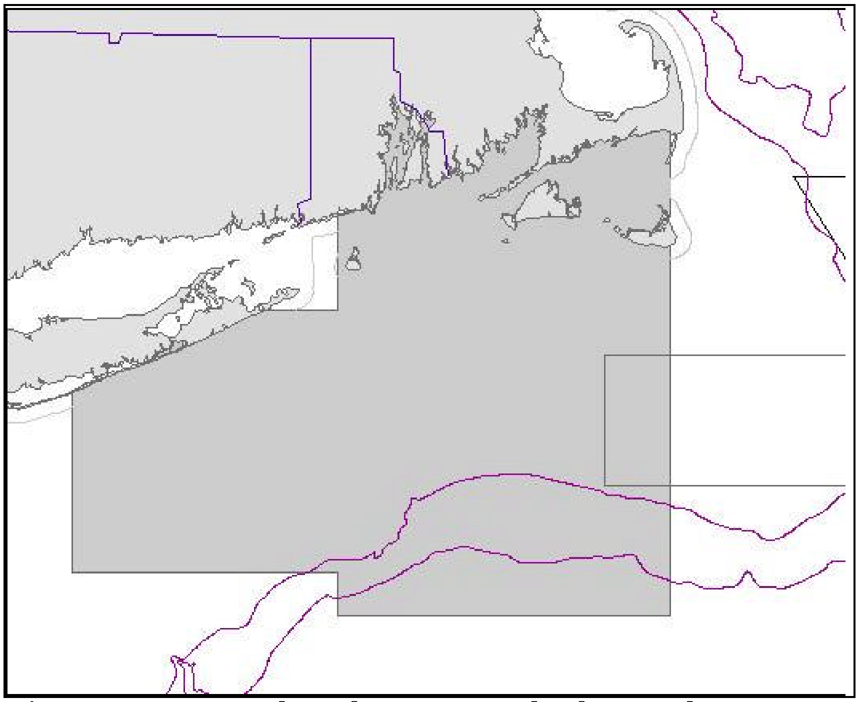


Figure 158 - Proposed Southern New England General Category Scallop Exemption Area.

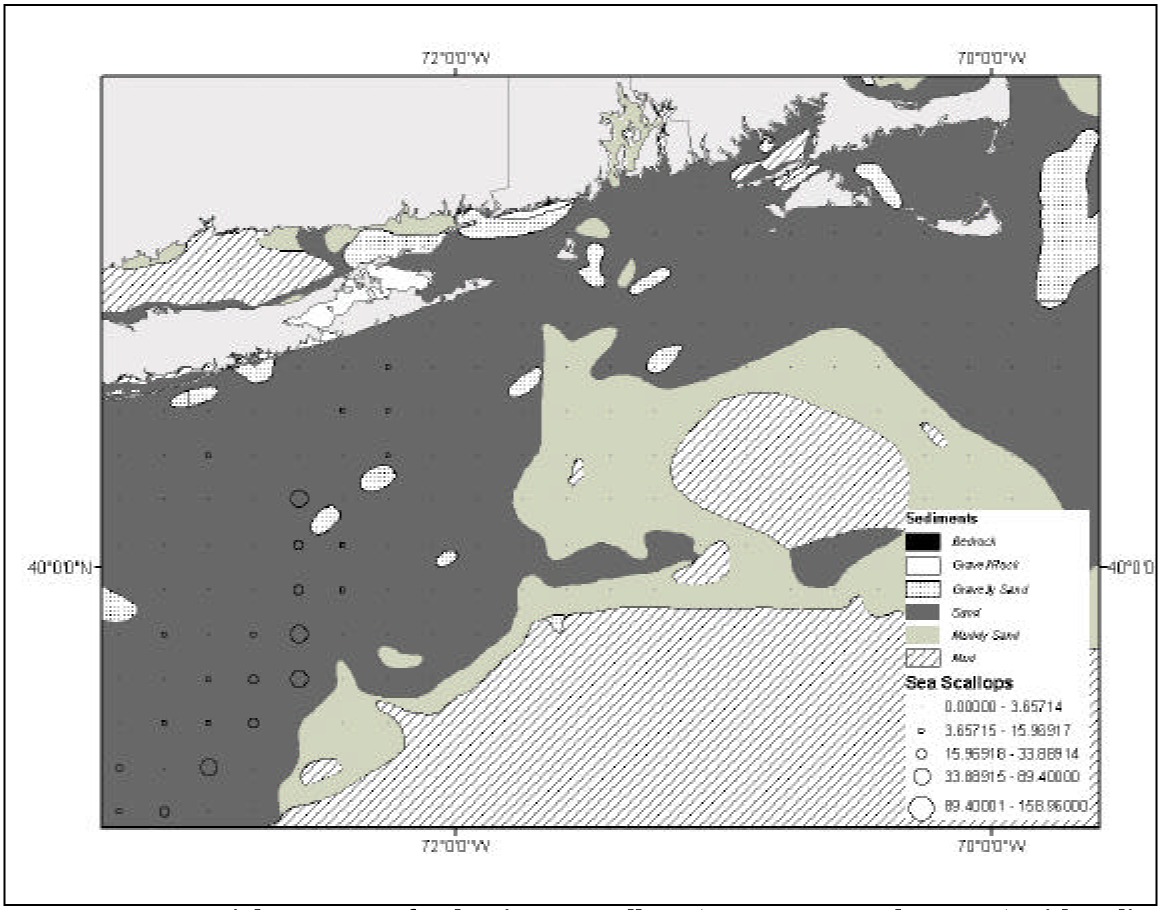


Figure 159 - Mean weight per tow of Atlantic Sea Scallops (1995-2001 trawl surveys) with sediment types of the affected area (modified from original map by Poppe et al. 1989).

The area affected by this alternative consists of primarily sandy, muddy sand and muddy sedimentation, with small patches of gravelly sand near the western boundary of the exemption area. Trawl survey data show scallop populations only along the western boundary of this exemption area. There is no data to indicate an overall increase in expected effort directed at the area covered by this exemption. Based on the relatively small amounts of scallops available inside the exempted area and this area's sedimentary makeup, no significant negative impacts to EFH are anticipated.

5.3.8 Alternatives to Minimize Adverse Effects of Fishing on Essential Fish Habitat

5.3.8.1 No Action Alternative

See analysis of habitat impacts under Section **5.3.6.2**.

5.3.8.2 Alternative 2 – Benefits to Essential Fish Habitat of Other Amendment 13 Measures *(Proposed Measure)*

This section will summarize the potential habitat benefits of the non-habitat Amendment 13 measures. Applying the benefits of these measures to achieve the habitat objectives of the Magnuson-Stevens Act would incur no additional regulatory burden on the fishing community or enforcement/monitoring agencies. However, these measures may not minimize the adverse effects of fishing on EFH at all, or as effectively as the proposed habitat protection alternatives.

The measures being proposed to address rebuilding requirements have the most benefits to habitat because they include significant effort reductions. The proposed action for Amendment 13 will reduce DAS allocations by 60% for A days, and 40% for B days. Long term this effort level may increase when stocks recover, but the habitat impacts from this measure are positive when compared to the No Action level of effort. The habitat impacts of the various rebuilding strategies within the EIS are summarized in Table 137. Furthermore, Cashes Ledge will become a year-round closed area as well, which will increase habitat benefits in that area. The alternatives proposed to address overcapacity will also have positive benefits for EFH by reducing the amount of time that vessels can spend fishing. There are other measures being proposed in Amendment 13 that have neutral or negative impacts on habitat, but overall they are outweighed by the positive impacts of the rebuilding program, thus the net impact of the non-habitat measures proposed in Amendment 13 are positive for habitat impacts.

Alternative	Overall Habitat Impact	Feature	Description of Habitat Impact
Observer Coverage (Fishery Program Admin.)	Indirect benefits (+)	10% requested by 2006 for each gear type, unless NMFS another appropriate level	If observers are able to collect data of interest to EFH management, increased coverage could indirectly benefit habitat.
Alternatives to Control Capacity	Positive Impact (+)	DAS can be transferred with restrictions and new measures for "reserve days"	Any measure that is intended to reduce the amount of time fishing by bottom-tending mobile gear will likely have benefits to EFH. These measures reduce amount of latent effort as well.
Management Measures to Address Rebuilding Requirements	Overall Positive Impact (+)	Mix of adaptive and phased reduction strategies. Provides opportunity to fish on stocks that do not need rebuilding	The effort reductions, year-round closed areas, and existing gear modifications are likely to have large positive impacts on EFH.
Effort Controls	Positive Impact (+)	A days (60% of effective effort) B days (40% of effective effort) C days (FY01 allocation)	Reducing DAS will benefit EFH by reducing the amount of time vessels can fish. Benefits will vary by area, gear, and habitat type, and will be higher in sensitive habitat areas (e.g., hard bottom) where bottom trawls and scallop dredges are currently being used.
Management Measures	Positive (+)	Same as settlement agreement unless specified	Overall measures are beneficial to EFH, especially effort reduction measure applicable largely to bottom tending mobile gear.
Closed Areas	Positive Impact (+)	Maintains existing groundfish closures and add Cashes Ledge as a year round closure.	Year-round closures provide habitat benefits to the areas within the closures. The addition of Cashes Ledge as a year-round closure will benefit the EFH and rare kelp beds found in that area.

Table 138 – Summary of the non-habitat measures proposed in Amendment 13 that have positive impacts on EFH

5.3.8.3 Alternatives 3 – 6, 10a and 10b (Habitat Closed Area Alternatives)

5.3.8.3.1 Environmental Attributes of Proposed Habitat Closed Area Alternatives

The alternatives under consideration include five primary habitat closure alternatives. Three of these include more than one option. In all, there are ten closed area options. The areas potentially impacted by these closures are described here using six metrics to summarize their ecological characteristics and to determine the differences between them. All ten closure options include more than one discrete closed area. The six metrics are:

SIZE and OVERLAP – Size of each proposed closed area option and overlap with year-round closed areas.

SUBSTRATE – Area of each sediment or substrate type contained within each proposed closure.

EFH – The amount of vulnerable species' EFH encompassed by each proposed closure.

TROPHIC GUILD – Biomass encompassed by each closure for five guilds: planktivores, amphipod eaters, shrimp and fish eaters, benthivores, and piscivores.

SPECIES ASSEMBLAGE - Biomass encompassed by each closure for three species aggregations: elasmobranchs, demersal species, and pelagic species.

BENTHIC SPECIES - Biomass encompassed by each closure for six species (longhorn sculpin, sea raven, redfish, ocean pout, jonah crab and American lobster) with high levels of association to benthic habitats.

When assessing the environmental attributes of the proposed closure alternatives, the No Action Alternative (which does not contain areas closed expressly for EFH protection) is included as a point of reference.

5.3.8.3.1.1 Size and Overlap with Groundfish Closed Areas

Methodology

The area (in square nautical miles) of the ten habitat closed area options and of the year-round groundfish closures that were in place during the 2001 fishing year (the No Action Alternative) are shown in Table 139, along with the area and percentage of each proposed habitat closed area that lies inside the boundaries of the existing groundfish closed areas (Type A Closure). Also shown in this table is the degree to which each proposed habitat closed area overlaps with areas that have been off-limits to groundfish and scallop gear on a continuous basis since December, 1994 (Georges Bank) or May 1998 (western Gulf of Maine) (Type B Closure) – when the groundfish closures were first established – and how much of each habitat closed area alternative was exposed to scallop dredging during 1999 and 2000 under the FW 13 Scallop Access Program (Type C Closure). These distinctions are important because the potential added value of continued habitat protection is different for type B and C closures.

	AREA (nm^2)	**PERCENT AREA**
Total	**83,550**	**---**
NoAction	**5853**	**7.0%**
3(a)	2913	3.5%
3(b)	2821	3.4%
4	2241	2.7%
5(a)	3032	3.6%
5(b)	3073	3.7%
5(c)	3022	3.6%
5(d)	3098	3.7%
6	4041	4.8%
10(a)	3050	3.7%
10(b)	2811	3.4%

Table 139 – Total and percent of total area contained inside each closed area alternative, as compared to the entire Northwest Atlantic analysis area.

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.

Alternative	Total	Type A		Type B		Type C	
	Area	*Area (nm^2)*	*Percent overlap*	*Area (nm^2)*	*Percent overlap*	*Area (nm^2)*	*Percent Overlap*
3a	2913	1550	53%	1239	43%	311	11%
3b	2821	1550	55%	1239	44%	311	11%
4	2241	1550	69%	1239	55%	311	14%
5a	3032	147	5%	147	5%	0	0%
5b	3073	154	5%	66	2%	88	3%
5c	3022	0	0%	0	0%	0	0%
5d	3098	185	6%	185	6%	0	0%
6	4041	4041	100%	4041	100%	0	0%
10a	3050	2506	82%	2348	77%	158	5%
10b	2811	2263	81%	2104	75%	159	6%

Table 140 – Area (square nautical miles) and percent of each habitat alternative that overlaps with groundfish closed areas, the FW13 scallop access areas, and the portions of the groundfish closed areas that have remained closed since December 1994.

Type A - Area and percentage of proposed habitat closed areas that overlap with existing year-round groundfish closed areas

Type B - Area and percentage of proposed habitat closed areas that overlap with portions of the groundfish closed areas areas that remained closed under the FW 13 Scallop Access program

Type C - Area and percentage of proposed habitat closed areas that overlap with portions of the groundfish closed areas that were opened to scallop dredging in 1999 and 2000 and closed again in 2001

Results of Size and Overlap Analysis

Type A:

The areas that do not overlap with any portion of the existing groundfish closed areas (e.g., 43% of alternative 3a) have been continuously exposed to mobile, bottom-tending gear (see Section 9.3.1: Fishing Gear Effects Evaluation Section/Distribution of Fishing Activities). Closing areas of bottom that have been intensively fished by these gears will provide long-term benefits to habitat and the net gain in habitat quality (improved function and value) will be greater than in portions of habitat closed areas that are located inside the groundfish closed areas. Because alternatives 3, 4, 6 and 10 were designed around existing year-round closed areas, the percentage of overlap is high. Conversely, because all the options under Alternative 5 were designed with closures in five pre-defined eco-regions and were not associated with any of the existing groundfish closed areas, their overlap is very low.

Type B:

These are areas that have been protected from the effects of most mobile, bottom-tending gear since December 1994 on Georges Bank and since May 1998 in the western Gulf of Maine (see Section 4.3.6.1.2.1 for an analysis of bottom fishing activities that took place in the closed areas during 1998-2001). Keeping these areas closed will maintain/continue existing habitat protection and values that have accumulated during the past 5-9 years. However, depending on the substrate types that exist in these areas and recovery times required to restore seafloor features and benthic communities from the effects of bottom fishing that occurred before these areas were closed, any extended habitat protection in these areas will yield minimal additional habitat benefits because recovery may be mostly complete by now. On the other hand, establishment of these areas as habitat closed areas will guarantee that accumulated benefits will not be lost. Consequently, failure to keep these areas closed will have serious consequences for habitat quality, depending on what kind of habitat is contained within them. Alternatives that fall into this category are 3a and b, 4, 6, and 10 a and b. None of the alternative 5 options are strong type B closures.

Type C:
These are areas that benefited from year-round area closures for either four (Closed Area I and the Nantucket Lightship Closed Area) or five years (Closed Area II), and then were exposed to scallop dredging effects for one (CAII) or two (CAI and NLSCA) years under the Framework 13 Scallop Access Program. They were closed again in May of 2001. Figure 149 shows where and how much scallop dredging took place in these areas in 1999/2000. Closing these areas will provide short-term habitat benefits that are intermediate between types A and B since recovery of habitat features was interrupted during 1999/2000. Recovery from the adverse effects of fishing varies according to the type of habitat – faster for sandy areas and slower for hard bottom areas – and will also be affected by the degree of natural disturbance in the area. For instance, the southern portion of CAII is deeper and sandier and therefore less vulnerable than the shallower, northern portion which has more gravel. (Additionally, see Figure 160 and Figure 162 for substrate features of CAI). Failure to keep these areas closed to scallop dredging and bottom trawling would forfeit gains made over the last three years. Small portions of alternatives 3a, 3b, 4, 5b, 10a and 10b overlap with the FW13 scallop access areas.

5.3.8.3.1.2 Substrate

Methodology

Sediment (or substrate) type is a habitat characteristic that is used, in the comparison of habitat closed area alternatives, to represent different types of benthic habitat that are more or less vulnerable to the adverse effects of fishing. Sandy substrates, for example, are considered to be more dynamic (i.e., more subject to alteration by natural events such as bottom currents) and less vulnerable to disturbance by mobile, bottom-tending fishing gear than structurally more complex "hard bottom" (gravel, cobble, pebble and boulder) habitats, especially if they support attached epifaunal organisms (e.g., sponges, corals, bryozoans, anemones) that can be easily damaged or removed from the bottom by bottom trawls and dredges. Seafloor features and benthic communities found in sandy bottom areas also recover more quickly following disturbance than in hard bottom habitats. This approach is supported by conclusions cited in two recent reports (NREFHSC 2002 and NRC 2002) regarding the vulnerability of different substrates to fishing gear effects.

To establish the sedimentary composition of the various closure options, a U.S. Geological Survey dataset was used (for more information, see Appendix XI). This dataset contains sediment data for 975 sampling locations throughout the entire Northeast region (U.S.- Canada border to North Carolina) and was used by Poppe *et al.* (1986, 1989) to map the distribution of nine sediment types, which were reduced to six for the purposes of this analysis (Figure 161). Most of the samples that were analyzed in developing this database were collected using bottom grab samplers. Higher-resolution data sets, such as that based on bottom video work by Stokesbury and Harris (2002), have been made available to the Council but do not cover a sufficiently large geographic area to be useful for a comprehensive evaluation of closure options. These high-resolution data do, however, point out the limitations of the USGS dataset when employed at a small scale. Figure 162 demonstrates that, at small scales, the USGS maps fail to capture the variety of substrates on a scale at which spatial changes in substrates tend to occur. In the absence of similar datasets covering the range of the Northwest Atlantic Analysis Area (NAAA), however, the USGS substrate maps will serve as the best available data for the purposes of description and analysis. Analyses were based on a digitized sediment data set generated from the sediment map shown in Figure 138 and conducted in a GIS format. Table 141 shows the percent that each sediment type makes up of the total area of each sediment type in the NAAA while Table 142 shows the percent sediment composition of each closed area alternative.

The term “gravel,” as used in this analysis, is a collective term that includes granules, pebbles, cobbles, and boulders in order of increasing size. Therefore, the term “gravel” refers to particles larger than sand and generally denotes a variety of “hard bottom” substrates. Granules are slightly coarser than coarse sand and are 2-4 mm in maximum diameter. Pebbles range in size from granules up to 64 mm (2.5 inches) in diameter. Cobbles range in size from pebbles up to 256 mm (10 inches) in diameter. Boulders are larger than cobbles. Common “gravel” bottom types occurring offshore are pebble gravel (pebble pavements); pebble/cobble gravel; and pebble/cobble/boulder mixtures. They all can support attached epifauna and can be vulnerable to disturbance by mobile bottom gear. Pebble gravel and pebble/cobble gravel often overlie sand, and if the gravel has been disturbed, the sand will be visible between pebbles and cobbles.

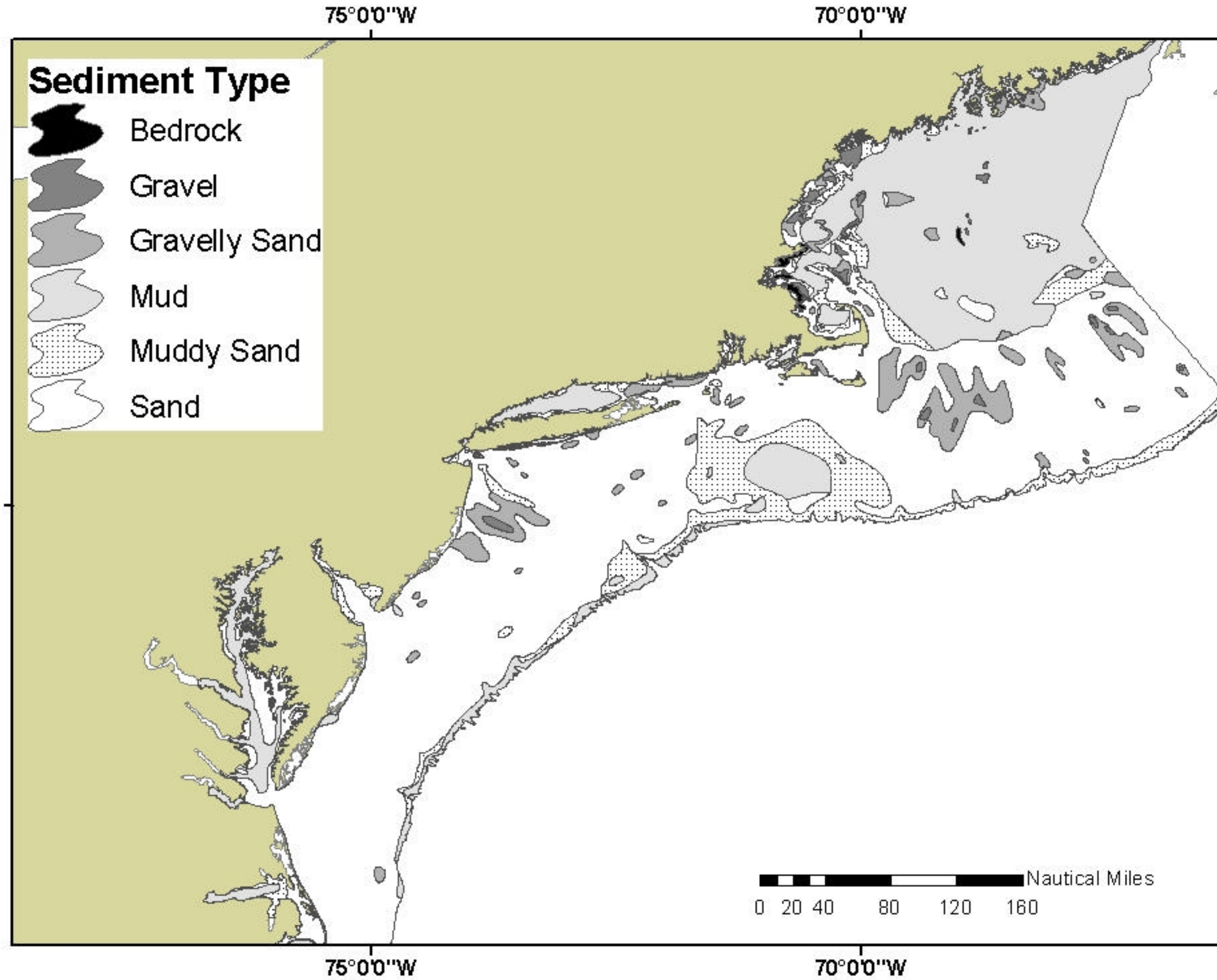


Figure 160 – Sediment map of the Northwest Atlantic Analysis Area based on Poppe *et al.* data (1989)

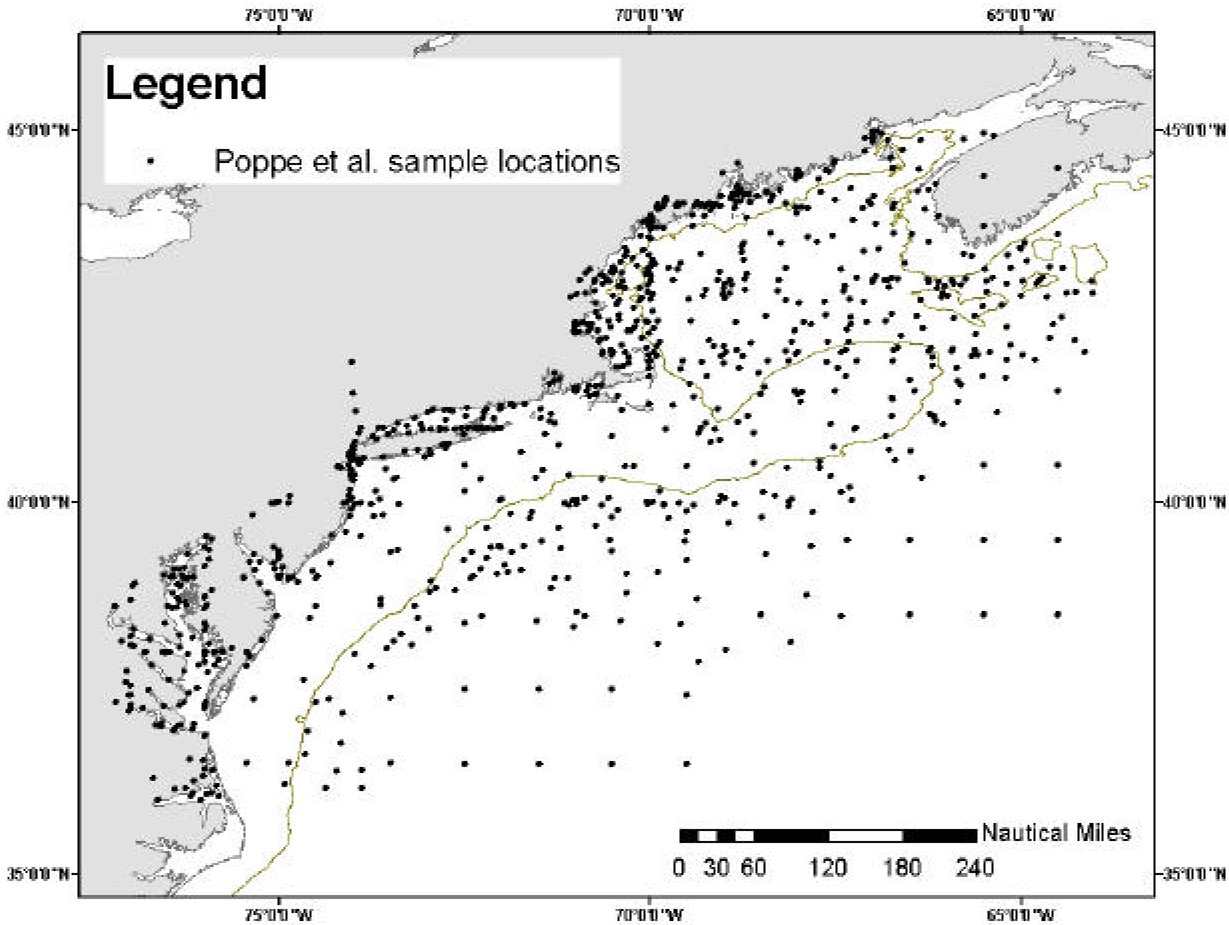


Figure 161 – Poppe *et al.* (1989) sampling locations

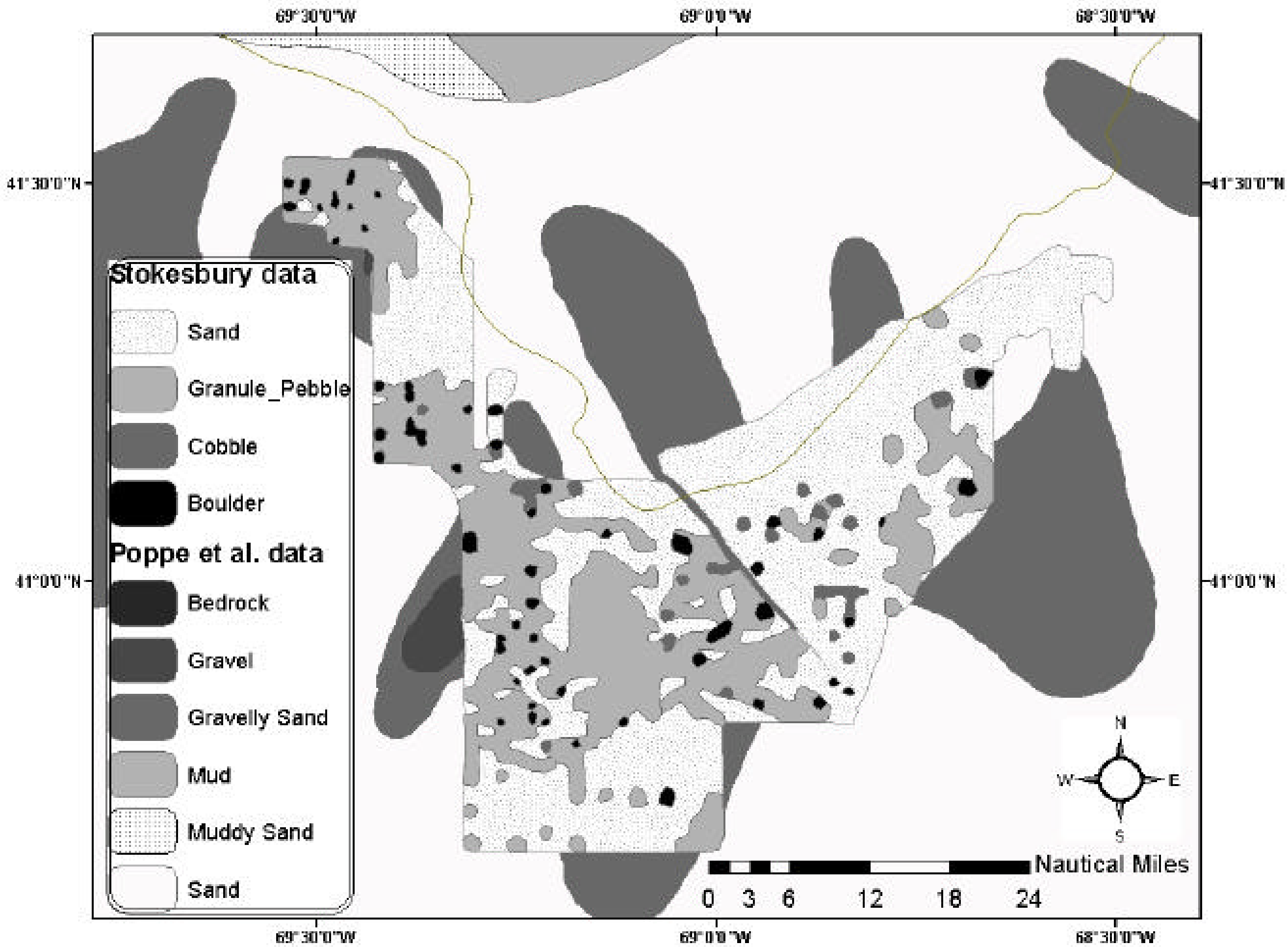


Figure 162 – Stokesbury and Harris (2002) substrate data for areas on Nantucket Shoals from Asia Rip north to Davis Bank and extending west into Closed Area I.

Results of sediment compositions

Alternatives 3 (a), 3(b), 4, 5a, 10a and 10b are the only alternatives to contain areas of bedrock as defined by the Poppe *et al.* data. Alternative 10a and 10b seem to contain a more complex bottom in that area (bedrock and gravel), more than some of the alternatives and less than others. Alternatives 3a, 3b, and 4 contain more gravel and Gravelly sand than the other alternatives, but Alternative 6, 10a, and 10b also contain a significant amount of these sediment types. Alternatives 5(b), 5(c), 6, 10a and 10b are comprised of over 50% sand, and 5(a) contains the highest amount of mud.

	AREA		Bedrock		Gravel		Gravelly Sand		Sand		Muddy Sand		Mud	
Total	83,550		150		556		4236		49620		7141		20378	
No Action	**5853**	7.0%	**0**	0%	**106**	19%	**1,041**	25%	**3,825**	8%	**413**	6%	**413**	2%
3(a)	2913	3.3%	**19**	13%	**177**	32%	**915**	22%	**985**	2%	**90**	1%	**540**	3%
3(b)	2821	3.2%	**19**	13%	**177**	32%	**916**	22%	**958**	2%	**88**	1%	**479**	2%
4	2241	2.7%	**15**	10%	**139**	25%	**778**	18%	**885**	2%	**83**	1%	**342**	2%
5(a)	3032	3.4%	**0**	0%	**21**	4%	**126**	3%	**1,226**	2%	**507**	7%	**991**	5%
5(b)	3073	3.6%	**0**	0%	**15**	3%	**313**	7%	**1,879**	4%	**188**	3%	**576**	3%
5(c)	3022	3.4%	**5**	3%	**27**	5%	**107**	3%	**1,526**	3%	**356**	5%	**783**	4%
5(d)	3098	3.5%	**0**	0%	**38**	7%	**101**	2%	**1,049**	2%	**668**	9%	**511**	3%
6	4041	4.8%	**0**	0%	**92**	17%	**666**	16%	**2,454**	5%	**413**	6%	**413**	2%
10(a)	3050	3.7%	**4**	2%	**105**	19%	**514**	12%	**1,839**	4%	**147**	2%	**443**	2%
10(b)	2811	3.4%	**4**	2%	**105**	19%	**461**	11%	**1,653**	3%	**147**	2%	**443**	2%

Table 141 – Total and percent of total sediment type contained inside each closed area alternative, as compared to the entire Northwest Atlantic analysis area.

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.
Note: "Gravel" substrate is defined to include granules, pebbles, cobbles, and boulders

	Bedrock	Gravel	Gravelly Sand	Sand	Muddy Sand	Mud
No Action	0%	2%	18%	65%	7%	7%
3(a)	1%	6%	34%	36%	3%	20%
3(b)	1%	7%	35%	36%	3%	18%
4	1%	6%	35%	39%	4%	15%
5(a)	0%	1%	4%	43%	18%	35%
5(b)	0%	1%	11%	63%	6%	19%
5(c)	0%	1%	4%	54%	13%	28%
5(d)	0%	1%	3%	36%	23%	18%
6	0%	2%	16%	61%	10%	10%
10(a)	0%	4%	17%	60%	5%	15%
10(b)	0%	4%	16%	58%	5%	16%

Table 142 – Sediment composition of each closed area alternative (Note: the values add up to 100%).

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.
Note: "Gravel" substrate is defined to include granules, pebbles, cobbles, and boulders

5.3.8.3.1.3 Essential Fish Habitat

Methodology

Twenty-three species have been identified as having EFH for at least one life stage moderately or highly vulnerable to the effects of bottom-tending mobile gear (see Section 9.3.1: Gear Effects Evaluation and Adverse Impact Determination Section). Closed areas provide habitat protection for these species and life stages. This analysis can be used to evaluate how the different alternatives rank in terms of EFH protection for the species that are moderately or highly vulnerable to bottom tending gear. The EFH area contained in a closure is calculated by summing the geographic area (in square nautical miles) of the ten minute squares of latitude and longitude (or portions thereof) that are designated as EFH for each species and life stages that is bounded by each proposed closure. Geographic EFH designations are defined in the Omnibus EFH Amendment (NEFMC 1998) and in several species FMPs adopted by the NEFMC and MAFMC. Table 143 summarizes the total and percent-of-total EFH area in the Northwest Atlantic Analysis Area (NAAA) for each of the vulnerable species and life stages (A= Adults, J= Juveniles and E= Eggs) encompassed by each of the closed area alternatives. The total EFH area for each of these species and life stages is shown in the first column. The sum of EFH area values for all species and life stages in each closure alternative and the percent that each closure sum makes up the total EFH in the entire NAAA (sum of column 1) are shown at the bottom of the table.

Total EFH	Species	N. A.		3a		3b		4		5a		5b		5c		5d		6		10a		10b	
AREA		5853		2913		2821		2241		3032		3073		3022		3098		4041		3050		2811	
nm2		nm2	%	nm2	%	nm2	%	nm2	%	nm2	%	nm2	%	nm2	%	nm2	%	nm2	%	nm2	%	nm2	%
13449	Black sea bass A	150	1.1	0	0.0	0	0.0	0	0.0	547	4.1	306	2.3	695	5.2	346	2.6	152	1.1	76	0.6	76	0.6
13503	Black sea bass	154	1.1	0	0.0	0	0.0	0	0.0	1199	8.9	823	6.1	1188	8.8	957	7.1	154	1.1	79	0.6	79	0.6
22076	Coda	3874	17.5	2688	12.2	2598	11.8	2203	10.0	1641	7.4	1992	9.0	1773	8.0	1197	5.4	2545	11.5	2285	10.4	2047	9.3
12968	Cod_J	2974	22.9	2163	16.7	2072	16.0	1706	13.2	821	6.3	1318	10.2	1026	7.9	1048	8.1	2254	17.4	2127	16.4	1981	15.3
15664	Haddock_A	3717	23.7	2421	15.5	2337	14.9	1940	12.4	1388	8.9	1269	8.1	1095	7.0	1093	7.0	2339	14.9	1989	12.7	1752	11.2
13746	Haddock_J	3135	22.8	2127	15.5	2044	14.9	1667	12.1	827	6.0	1408	10.2	959	7.0	1206	8.8	1661	12.1	1560	11.3	1404	10.2
5625	Halibut_A	1048	18.6	1059	18.8	1061	18.9	958	17.0	424	7.5	374	6.7	424	7.5	274	4.9	862	15.3	689	12.2	797	14.2
5625	Halibut_J	1048	18.6	1059	18.8	1061	18.9	958	17.0	424	7.5	374	6.7	424	7.5	274	4.9	862	15.3	689	12.2	797	14.2
17891	American plaice_A	1820	10.2	1209	6.8	1120	6.3	921	5.1	1707	9.5	1465	8.2	1688	9.4	1112	6.2	1545	8.6	1494	8.3	1413	7.9
15427	American plaice_J	1440	9.3	1149	7.4	1060	6.9	861	5.6	1707	11.1	1465	9.5	1688	10.9	1112	7.2	1240	8.0	1345	8.7	1345	8.7
14624	Pollock_A	1533	10.5	1469	10.0	1392	9.5	1129	7.7	1411	9.6	1271	8.7	1044	7.1	741	5.1	1255	8.6	1230	8.4	1268	8.7
28685	Ocean Pout A	4618	16.1	1919	6.7	1827	6.4	1582	5.5	2173	7.6	2614	9.1	2298	8.0	2262	7.9	3174	11.1	2224	7.8	1956	6.8
32867	Ocean pout_E	2	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	2543	7.7	2275	6.9
18435	Ocean pout_J	1820	9.9	1070	5.8	979	5.3	845	4.6	1870	10.1	1864	10.1	1997	10.8	1506	8.2	1427	7.7	1131	6.1	1058	5.7
21241	Redfish_A	1757	8.3	1610	7.6	1522	7.2	1322	6.2	1715	8.1	1465	6.9	1696	8.0	1194	5.6	1465	6.9	1512	7.1	1511	7.1
22009	Redfish_J	1759	8.0	1559	7.1	1468	6.7	1258	5.7	1758	8.0	1465	6.7	1739	7.9	1163	5.3	1593	7.2	1411	6.4	1521	6.9
37038	Red hake_A	3274	8.8	1418	3.8	1330	3.6	1130	3.1	2474	6.7	2536	6.8	2378	6.4	2189	5.9	2431	6.6	1901	5.1	1901	5.1
43285	Red hake_J	4653	10.7	2318	5.4	2259	5.2	1898	4.4	2917	6.7	2458	5.7	2969	6.9	2426	5.6	3324	7.7	2301	5.3	2166	5.0
20768	Scup_J	711	3.4	99	0.5	99	0.5	97	0.5	902	4.3	1200	5.8	1031	5.0	1010	4.9	562	2.7	493	2.4	493	2.4
2345	SkateBarndoor_A	522	22.3	178	7.6	178	7.6	105	4.5	0	0.0	75	3.2	0	0.0	76	3.2	331	14.1	153	6.5	224	9.6
11264	SkateBarndoor_J	3026	26.9	851	7.6	848	7.5	759	6.7	377	3.3	679	6.0	450	4.0	835	7.4	1823	16.2	1238	11.0	1099	9.8
14232	SkateClearnose_A	332	2.3	0	0.0	0	0.0	0	0.0	436	3.1	225	1.6	436	3.1	491	3.5	244	1.7	266	1.9	266	1.9
16449	SkateClearnose_J	540	3.3	274	1.7	231	1.4	231	1.4	656	4.0	521	3.2	730	4.4	788	4.8	452	2.7	518	3.2	518	3.2
36449	SkateLittle_A	4702	12.9	1810	5.0	1805	5.0	1523	4.2	1356	3.7	2171	6.0	1702	4.7	1448	4.0	2900	8.0	1943	5.3	1703	4.7
50044	SkateLittle_J	5086	10.2	1837	3.7	1837	3.7	1641	3.3	1951	3.9	2395	4.8	1929	3.9	1596	3.2	3286	6.6	2236	4.5	1997	4.0
624	SkateRosette_A	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
7903	SkateRosette_J	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	327	4.1	0	0.0	0	0.0	0	0.0
11039	SkateSmooth_A	1588	14.4	1249	11.3	1157	10.5	1062	9.6	1558	14.1	1185	10.7	1407	12.7	1037	9.4	1252	11.3	1202	10.9	1286	11.6
20929	SkateSmooth_J	1947	9.3	1667	8.0	1575	7.5	1374	6.6	1683	8.0	1633	7.8	1682	8.0	1163	5.6	1551	7.4	1453	6.9	1538	7.3

Table 143 - Total and percent-of-total EFH area for species with EFH identified as vulnerable to bottom-tending mobile gear.

Total EFH	Species	N. A.		3a		3b		4		5a		5b		5c		5d		6		10a		10b	
AREA		**5853**		**2913**		**2821**		**2241**		**3032**		**3073**		**3022**		**3098**		**4041**		**3050**		**2811**	
nm2		**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**	**nm2**	**%**
18193	SkateThorny_A	1660	9.1	1528	8.4	1468	8.1	1200	6.6	1716	9.4	1690	9.3	1770	9.7	1196	6.6	1333	7.3	1362	7.5	1473	8.1
26586	SkateThorny_J	3444	13.0	2328	8.8	2237	8.4	1891	7.1	1866	7.0	1916	7.2	1846	6.9	1498	5.6	2453	9.2	2007	7.5	1847	6.9
25769	SkateWinter_A	4345	16.9	1993	7.7	1959	7.6	1689	6.6	1501	5.8	1723	6.7	1866	7.2	1136	4.4	2572	10.0	1810	7.0	1570	6.1
39452	SkateWinter_J	5283	13.4	2063	5.2	2058	5.2	1822	4.6	2027	5.1	2841	7.2	2450	6.2	1901	4.8	3475	8.8	2312	5.9	2072	5.3
1466	Tilefish_A	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2852	Tilefish_J	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	1	0.1
47268	Silver hake_J	4750	10.0	2134	4.5	2044	4.3	1772	3.7	2990	6.3	2535	5.4	2969	6.3	2506	5.3	3336	7.1	2239	4.7	2077	4.4
21884	White hake_J	2616	12.0	1464	6.7	1406	6.4	1163	5.3	1643	7.5	1621	7.4	1697	7.8	1656	7.6	1815	8.3	1662	7.6	1512	6.9
19285	Winter flounder_A	2977	15.4	1750	9.1	1701	8.8	1392	7.2	1424	7.4	1701	8.8	1851	9.6	830	4.3	2361	12.2	1825	9.5	1585	8.2
19847	Witch flounder_A	1442	7.3	993	5.0	904	4.6	705	3.5	1785	9.0	1108	5.6	1556	7.8	1417	7.1	1445	7.3	1186	6.0	1186	6.0
15489	Witch flounder_J	440	2.8	592	3.8	545	3.5	382	2.5	963	6.2	717	4.6	1091	7.0	756	4.9	440	2.8	511	3.3	511	3.3
23102	Yellowtail flounder_A	4629	20.0	1476	6.4	1461	6.3	1224	5.3	1518	6.6	2017	8.7	1792	7.8	1667	7.2	2838	12.3	1753	7.6	1511	6.5
20199	Yellowtail flounder_J	3584	17.7	1028	5.1	1015	5.0	825	4.1	990	4.9	1795	8.9	1488	7.4	1139	5.6	1945	9.6	1238	6.1	1184	5.9
827595	SUM of vuln. EFH	92399		50554		48655		41232		52347		54219		54825		44574		64701		53995		51004	
	Sum of Vulnerable EFH in closure / sum of total Vulnerable EFH	**11.2%**		**6.1%**		**5.9%**		**5.0%**		**6.3%**		**6.6%**		**6.6%**		**5.4%**		**7.8%**		**6.5%**		**6.2%**	

Table 143 - Total and percent-of-total EFH area for species with EFH identified as vulnerable to bottom-tending mobile gear.

**Values are not scaled for area*

The No action (N.A) alternative is included for comparative purposes only. It is not under consideration as a habitat closure in Amendment 13.

Results of EFH Analysis

Total and percent-of-total EFH area values for all species and life stages with vulnerable EFH range from 41,232 nm^2 (5%) for alternative 4 and 64,701 nm^2 (7.8%) for alternative 6. Alternative 5d also ranked very low while the remaining seven alternatives had intermediate values ranging from 5.9% to 6.6%. Overall, less than 10% of the total EFH for the majority of species and life stages with vulnerable EFH occurs within the habitat closures. Species with high percentages of EFH area are cod (A,J), haddock (A,J), and halibut (A,J). Since the amount of EFH in each alternative varies depending on the size of the closure, the total EFH area values in for each alternative were also divided by the size of each alternative (see Table 153 in Section 4.3.8.3.2). These per-unit-area EFH values measure the relative effectiveness of each proposed habitat closure in protecting EFH for these species. On a per-unit-area basis, alternatives 5d and 6 have low EFH scores (15.2% and 16%), 5c has the highest value (19.7%), and the other seven alternatives have intermediate scores ranging from 17.7% to 18.5%. Per-unit-area EFH values were also calculated for species with highly vulnerable EFH, New England species with highly vulnerable EFH, and for overfished species with highly vulnerable EFH (see Section 4.3.8.3.2).

5.3.8.3.1.4 Trophic Guilds

Methodology

Cluster analysis (based on Garrison 2000) was used to define trophic guilds found in the Northwest Atlantic Analysis Area (NAAA). The general guild structure and levels of dietary overlap are consistent across both temporal and spatial scales. Complimentary analyses to the current study within the Georges Bank region identified similar trophic guilds and general stability in the trophic guild structure over the last three decades. Despite the notable changes in species composition in the Northeast shelf fish community, the patterns of trophic resource use and guild structure have remained remarkably consistent. Five trophic guilds were identified for this analysis: benthivores, amphipod eaters, planktivores, piscivores, and shrimp and fish eaters. The species and size ranges used to define these guilds are identified in Appendix XI. The Biological Environment section of the Amendment 13 SEIS document describes the trophic guilds in greater detail.

Table 149 describes the total and percent-of-total biomass for each guild that is contained within each closure alternative. Biomass is measured as the sum of the mean wt (kg) per tow from the 1995-2001 bottom trawl surveys for each ten-minute square (or fraction thereof) included within each closure area. Table 150 shows the percent composition by closure.

Benthivores	Size
HADDOCK	All
THORNY SKATE	S,M
YELLOWTAIL FLOUNDER	M,L
WINTER FLOUNDER	All
GULF STREAM FLOUNDER	All
WITCH FLOUNDER	All
SCUP	All
AMERICAN PLAICE	All
ATLANTIC CROAKER	All
OCEAN POUT	All

Table 144 – List of species and species' sizes in the benthivores guild.

Amphipod (shrimp) eaters	Size
FAWN CUSK-EEL	All
LONGHORN SCULPIN	All
WINDOWPANE	All
ATLANTIC COD	S,M
WINTER SKATE	S,M
LITTLE SKATE	S,M
RED HAKE	S,M
SPOTTED HAKE	S
WHITE HAKE	S
FOURSPOT FLOUNDER	S
YELLOWTAIL FLOUNDER	S

Table 145 – List of species and species' sizes in the amphipod eater's guild.

Planktivores	Size
NORTHERN SAND LANCE	All
ATLANTIC HERRING	All
BUTTERFISH	All
ATLANTIC MACKEREL	All
ALEWIFE	All
SPINY DOGFISH	S,M
NORTHERN SHORTFIN SQUID	L
LONGFIN SQUID	All

Table 146 – List of species and species' sizes in the planktivores guild.

Piscivores	Size
SPINY DOGFISH	L
SEA RAVEN	All
GOOSEFISH	All
BLUEFISH	All
WEAKFISH	All
SUMMER FLOUNDER	All
SPOTTED HAKE	M
ATLANTIC COD	L,XL
FOURSPOT FLOUNDER	M
SILVER HAKE	L
WHITE HAKE	L
THORNY SKATE	L,XL
WINTER SKATE	L,XL

Table 147 – List of species and species' sizes in the Piscivores guild.

Shrimp and Fish Eaters	Size
POLLOCK	All
SILVER HAKE	S,M
ACADIAN REDFISH	All
WHITE HAKE	M
RED HAKE	L
SMOOTH SKATE	All

Table 148 – List of species and species' sizes in the shrimp and fish eater's guild.

	Benthic		Ampshr		Plankt		Pisc		Shrfis	
Total	9,128		2,681		11,836		4,921		6,509	
No Action	**2,423**	26.5%	**1,052**	39.2%	**1,204**	10.2%	**492**	10.0%	**1,206**	18.5%
3(a)	**976**	10.7%	**254**	9.5%	**413**	3.5%	**125**	2.5%	**549**	8.4%
3(b)	**908**	9.9%	**245**	9.1%	**407**	3.4%	**121**	2.4%	**498**	7.6%
4	**859**	9.4%	**223**	8.3%	**356**	3.0%	**104**	2.1%	**464**	7.1%
5(a)	**541**	5.9%	**284**	10.6%	**708**	6.0%	**156**	3.2%	**354**	5.4%
5(b)	**778**	8.5%	**333**	12.4%	**947**	8.0%	**178**	3.6%	**152**	2.3%
5(c)	**634**	6.9%	**291**	10.8%	**731**	6.2%	**148**	3.0%	**189**	2.9%
5(d)	**589**	6.5%	**168**	6.3%	**933**	7.9%	**162**	3.3%	**247**	3.8%
6	**1,296**	14.2%	**489**	18.2%	**653**	5.5%	**190**	3.9%	**935**	14.4%
10(a)	**1,307**	14.3%	**248**	9.3%	**453**	3.8%	**117**	2.4%	**883**	13.6%
10(b)	**1,249**	13.7%	**222**	8.3%	**398**	3.4%	**127**	2.6%	**885**	13.6%

Table 149 – Total and percent-of-total biomass for each guild within each closed areaalternative.

Benthic = benthivore; Ampshr = amphipod/shrimp eater; Plankt = planktivore; Pisc = piscivore; Shrfis = shrimp/fish eater

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.

	Benthic	Ampshr	Plankt	Pisc	Shrfis
No Action	38%	16%	19%	8%	19%
3(a)	42%	11%	18%	5%	24%
3(b)	42%	11%	19%	6%	23%
4	43%	11%	18%	5%	23%
5(a)	26%	14%	35%	8%	17%
5(b)	33%	14%	40%	7%	6%
5(c)	32%	15%	37%	7%	9%
5(d)	28%	8%	44%	8%	12%
6	36%	14%	18%	5%	26%
10(a)	43%	8%	15%	4%	29%
10(b)	43%	8%	14%	4%	31%

Table 150 – Guild composition of each closure alternative

Benthic = benthivore; Ampshr = amphipod/shrimp eater; Plankt = planktivore; Pisc = piscivore; Shrfis = shrimp/fish eater

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.

Results of Trophic Guild Analysis

Closed area alternatives 6, 10a and 10b contain the highest biomass values for benthivores and shrimp-and-fish eaters, followed closely by 3a, 3b and 4. Amphipod-eaters biomass is highest in alternative 6 followed by alternatives 5a, 5b, and 5c. Planktivores and piscivores are most abundant in alternatives 5b and 5d. Guild biomass in alternatives 3a, 3b, 4, 6, 10a, and 10b is dominated by benthivores and shrimp/fish-eaters and by benthivores and planktivores in alternatives 5a-5d.

5.3.8.3.1.5 Species Assemblages

Methodology

Cluster analysis (based on Garrison 2000, Gabriel 1992) was used to define spatial-temporal assemblages for major taxonomic aggregates (i.e., principal groundfish, principal pelagics, demersals, pelagics and elasmobranchs) found in the NAAA. Species that were assigned to these assemblages are identified in Table 151. The Biological Environment section of the Amendment 13 SEIS describes the assemblages in greater detail.

Table 152 describes the total and percent-of-total biomass for each species assemblage that is contained within each closure alternative. Biomass is measured as the sum of the mean wt (kg) per tow from the 1995-2001 bottom trawl surveys for each ten minute square (or fraction thereof) included within each closure area. Table 153 shows the percent composition by closure.

Elasmobranchs	Principle Groundfish	Pelagic Species	Principle Pelagics
SPINY DOGFISH	ATLANTIC COD	ROUND HERRING	ATLANTIC HERRING
BARNDOOR SKATE	HADDOCK	CAPELIN	ATLANTIC MACKEREL
WINTER SKATE	ACADIAN REDFISH	ATLANTIC SILVERSIDE	
CLEARNOSE SKATE	SILVER HAKE	ATLANTIC MACKEREL	
ROSETTE SKATE	RED HAKE	BUTTERFISH	
LITTLE SKATE	POLLOCK	BLUEFISH	
SMOOTH SKATE	YELLOWTAIL FLOUNDER	WEAKFISH	
THORNY SKATE	SUMMER FLOUNDER	NORTHERN SHORTFIN SQUID	
	WINTER FLOUNDER	LONGFIN SQUID	
	WINDOWPANE	BAY ANCHOVY	
	AMERICAN PLAICE	LANTERNFISH UNCL	
Demersal Species			
SMOOTH DOGFISH	BLUE HAKE	SEA RAVEN	SILVERSTRIPE HALFBEAK
SPINY DOGFISH	METALLIC CODLING	BLACK SEA BASS	SLENDER SNIPE EEL
BARNDOOR SKATE	FOURBEARD ROCKLING	ACADIAN REDFISH	FLAT NEEDLEFISH
WINTER SKATE	CUSK	TILEFISH	OFFSHORE HAKE
CLEARNOSE SKATE	ATLANTIC HALIBUT	NORTHERN SAND LANCE	ATLANTIC CROAKER
ROSETTE SKATE	AMERICAN PLAICE	STRIPED CUSK-EEL	SCUP
LITTLE SKATE	SUMMER FLOUNDER	ARCTIC EELPOUT	SPOT
SMOOTH SKATE	FOURSPOT FLOUNDER	WOLF EELPOUT	ATLANTIC SEASNAIL
THORNY SKATE	YELLOWTAIL FLOUNDER	WRYMOUTH	NORTHERN SEAROBIN
SILVER HAKE	WINTER FLOUNDER	ATLANTIC WOLFFISH	STRIPED SEAROBIN
ATLANTIC COD	WITCH FLOUNDER	OCEAN POUT	ARMORED SEAROBIN
HADDOCK	WINDOWPANE	FAWN CUSK-EEL	SEAROBIN UNCL
POLLOCK	GULF STREAM FLOUNDER	GOOSEFISH	FLYING GURNARD
WHITE HAKE	HOOKEAR SCULPIN UNCL	EEL UNCL	CUNNER
RED HAKE	SCULPIN UNCL	HEADLIGHTFISH UNCL	TAUTOG
SPOTTED HAKE	MOUSTACHE SCULPIN	CONGER EEL	NORTHERN STARGAZER
LONGFIN HAKE	SHORTHORN SCULPIN	SNUBNOSE EEL	ROCK GUNNEL
HAKE UNCL	LONGHORN SCULPIN	MARGINED SNAKE EEL	

Table 151 – List of species belonging to each of the species assemblages

	Elasmo		Pringrd		Prinpel		Demersal		Pelagic	
Total	92,990		22,140		6,742		129,171		13,841	
NoAction	12,539	13.5%	6,192	28.0%	763	11.3%	20,117	15.6%	1,262	9.1%
3(a)	2,264	2.4%	2,242	10.1%	216	3.2%	4,968	3.8%	441	3.2%
3(b)	2,257	2.4%	2,089	9.4%	210	3.1%	4,784	3.7%	435	3.1%
4	1,990	2.1%	1,932	8.7%	181	2.7%	4,309	3.3%	378	2.7%
5(a)	3,880	4.2%	1,413	6.4%	522	7.7%	5,965	4.6%	800	5.8%
5(b)	6,133	6.6%	1,567	7.1%	680	10.1%	8,404	6.5%	1,004	7.3%
5(c)	3,801	4.1%	1,306	5.9%	525	7.8%	5,807	4.5%	825	6.0%
5(d)	3,478	3.7%	1,298	5.9%	784	11.6%	5,325	4.1%	952	6.9%
6	6,529	7.0%	3,243	14.6%	416	6.2%	10,374	8.0%	687	5.0%
10(a)	4,925	5.3%	2,885	13.0%	292	4.3%	8,216	6.4%	487	3.5%
10(b)	4,866	5.2%	2,800	12.6%	298	4.4%	8,063	6.2%	434	3.1%

Table 152 – Total and percent-of-total biomass for each assemblage within each closed area alternative.

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.

	Elasmo	Pringrd	Prinpel	Demersal	Pelagic
NoAction	31%	15%	2%	49%	3%
3(a)	22%	22%	2%	49%	4%
3(b)	23%	21%	2%	49%	4%
4	23%	22%	2%	49%	4%
5(a)	31%	11%	4%	47%	6%
5(b)	34%	9%	4%	47%	6%
5(c)	31%	11%	4%	47%	7%
5(d)	29%	11%	7%	45%	8%
6	31%	15%	2%	49%	3%
10(a)	29%	17%	2%	49%	3%
10(b)	30%	17%	2%	49%	3%

Table 153 – Assemblage composition of each closure alternative

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.

Results of Species Assemblage Analysis

High elasmobranch biomass values occur in alternatives 5b and 6, with relatively high values in 10a and 10b. High pelagic biomass occurs in all four of the alternative 5 options. Demersal finfish species are most abundant in alternative 6, but high values also occur in alternatives 5b, 10a, and 10b. Biomass of the principal groundfish assemblage is high in alternatives 6, 10a and 10b. The most abundant species assemblage in all ten closed area alternatives is the demersal finfish group.

5.3.8.3.1.6 Benthic Species

Methodology

Six species (longhorn sculpin, sea raven, redfish, ocean pout, jonah crab and American lobster) were chosen for their close association with benthic habitats for both feeding and protection from predators (see Appendix XI for spatial distribution of these species). Table 154 describes the total and percent-of-total biomass for each species that is contained within each closure alternative. Biomass is measured as the sum of the mean wt (kg) per tow from the 1995-2001 bottom trawl surveys for each ten minute square (or fraction there) included within each closure area. Table 155 shows the percent composition by closure.

	LhnScpn		SeaRvn		Redfish		OcPout		JonCrab		Lobster	
Total	1504.2		533.4		5870.6		1527.9		199.7		1179.8	
NoAction	**558**	37.1%	**162**	30.3%	**1,077**	18.3%	**173**	11.3%	**18**	9.2%	**103**	8.7%
3(a)	**187**	12.4%	**75**	14.1%	**452**	7.7%	**52**	3.4%	**3**	1.4%	**39**	3.3%
3(b)	**177**	11.8%	**72**	13.5%	**418**	7.1%	**48**	3.2%	**3**	1.3%	**37**	3.1%
4	**165**	11.0%	**67**	12.5%	**391**	6.7%	**39**	2.5%	**1**	0.6%	**34**	2.9%
5(a)	**239**	15.9%	**50**	9.4%	**266**	4.5%	**156**	10.2%	**15**	7.4%	**42**	3.5%
5(b)	**317**	21.1%	**78**	14.5%	**93**	1.6%	**88**	5.7%	**3**	1.6%	**90**	7.7%
5(c)	**271**	18.0%	**54**	10.0%	**116**	2.0%	**172**	11.3%	**3**	1.7%	**100**	8.5%
5(d)	**95**	6.3%	**61**	11.4%	**177**	3.0%	**209**	13.7%	**14**	7.1%	**28**	2.3%
6	**245**	16.3%	**73**	13.6%	**835**	14.2%	**63**	4.1%	**11**	5.3%	**47**	3.9%
10(a)	**151**	10.0%	**46**	8.6%	**778**	13.3%	**41**	2.7%	**7**	3.5%	**34**	2.9%
10(b)	**141**	9.4%	**56**	10.5%	**778**	13.3%	**40**	2.6%	**7**	3.5%	**23**	1.9%

Table 154 – Total and Percentage of total biomass for each specie s within each closed area alternative

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.

	LhnScpn	SeaRvn	Redfish	OcPout	JonCrab	Lobster
NoAction	27%	8%	51%	8%	1%	5%
3(a)	23%	9%	56%	6%	0%	5%
3(b)	23%	10%	55%	6%	0%	5%
4	24%	10%	56%	6%	0%	5%
5(a)	31%	7%	35%	20%	2%	5%
5(b)	47%	12%	14%	13%	0%	14%
5(c)	38%	7%	16%	24%	0%	14%
5(d)	16%	10%	30%	36%	2%	5%
6	19%	6%	66%	5%	1%	4%
10(a)	14%	4%	74%	4%	1%	3%
10(b)	13%	5%	74%	4%	1%	2%

Table 155 - Species composition of each closure alternative

NAA data are meant for comparison purposes. This NAA is not an alternative under consideration in Amendment 13.

Results of Benthic Species Analysis

Longhorn sculpin biomass is high in 5b and 5c; sea ravens in 3a, 3b, 4, 5b, and 6; redfish in 6, 10a, and 10b; ocean pout in 5a, 5c and 5d; jonah crab in 5a and 5d; and lobsters in 5b and 5c. Alternatives 3a, 3b and 4 are dominated by redfish and longhorn sculpins; 5a by longhorn sculpins, redfish, and ocean pout; 5b by longhorn sculpins; 5c by sculpins and ocean pout; 5d by redfish and ocean pout; and alternatives 6, 10a and 10b by redfish.

5.3.8.3.2 Summary of EFH Benefits of Area Closure Options

5.3.8.3.2.1 Purpose of this section

The M-S Act states that Councils are required to minimize, to the extent practicable, the adverse effects of fishing on EFH. It was concluded in the Gear Effects Evaluation and Adverse Impacts Determination (Section 9.3.2) that mobile bottom-tending gears (otter trawls, scallop dredges and clam dredges) have the potential to adversely impact the essential fish habitat for the benthic life stages of 23 federally-managed species that inhabit the Northeast regional ecosystem. The purpose of this section is to present the results of an EFH-specific analyses for each of the ten area closure alternatives that indicates the degree to which each closure option will protect EFH for these species. It also includes a summary of the substrate, trophic guild, and species assemblage characteristics of these species and life stages in each closed area alternative. The analyses are applied to the moderately and highly vulnerable species, to the highly vulnerable species, the highly vulnerable and overfished species, and the highly vulnerable species that are managed by the New England Fishery Management Council.

5.3.8.3.2.2 EFH-specific analysis: moderately and highly vulnerable species

The following three sections summarize results of habitat metric analyses in more detail for those species that have been defined as adversely impacted by mobile, bottom-tending gears, i.e., in a manner than is more than minimal and not temporary in nature (see Gear Effects Evaluation and Adverse Impact Determination section). This analysis begins with a list of the species and life stages with EFH that has been determined to be either moderately or highly vulnerable to mobile, bottom-tending gears (Table 156). The analysis evaluates the EFH protection afforded by all ten area closure alternatives on a per-unit-area basis (relative effectiveness indices) (see Table 157 through Table 160).

Species	Lifestage	Otter Trawl Vuln.	Scallop Dredge Vuln.	Clam Dredge Vuln.
American Plaice	A	High	High	None
American Plaice	J	Mod	Mod	None
Atlantic Cod	A	Mod	Mod	Mod
Atlantic Cod	J	High	High	None
Atlantic Halibut	A	Mod	Mod	None
Atlantic Halibut	J	Mod	Mod	None
Barndoor Skate	A	Mod	Mod	Low
Barndoor Skate	J	Mod	Mod	Low
Black Sea Bass	A	High	High	High
Black Sea Bass	J	High	High	High
Clearnose Skate	A	Mod	Mod	Mod
Clearnose Skate	J	Mod	Mod	Mod
Haddock	A	High	High	Low
Haddock	J	High	High	Low
Little Skate	A	Mod	Mod	Mod
Little Skate	J	Mod	Mod	Mod
Ocean Pout	A	High	High	High
Ocean Pout	J	High	High	High
Ocean Pout	L	High	High	High
Ocean Pout	E	High	High	High

Species	Lifestage	Otter Trawl Vuln.	Scallop Dredge Vuln.	Clam Dredge Vuln.
Pollock	A	Mod	Mod	Low
Red Hake	A	Mod	Mod	Low
Red Hake	J	High	High	High
Redfish	A	Mod	Mod	None
Redfish	J	High	High	None
Rosette Skate	A	Mod	Mod	Mod
Rosette Skate	J	Mod	Mod	Mod
Scup	J	Mod	Mod	Mod
Silver Hake	J	Mod	Mod	Mod
Smooth Skate	A	High	High	None
Smooth Skate	J	Mod	Mod	None
Thorny Skate	A	Mod	Mod	None
Thorny Skate	J	Mod	Mod	None
Tilefish	A	High	Low	None
Tilefish	J	High	Low	None
White Hake	J	Mod	Mod	None
Winter Flounder	A	Mod	Mod	Mod
Winter Skate	A	Mod	Mod	Mod
Winter Skate	J	Mod	Mod	Mod
Witch Flounder	A	Mod	Low	Low
Witch Flounder	J	Mod	Low	None
Yellowtail Flounder	A	Mod	Mod	Mod
Yellowtail Flounder	J	Mod	Mod	Mod

Table 156 - Species and life stages with EFH that is moderately or highly vulnerable to mobile, bottom-tending gears.

Shaded rows indicate species in the Northeast Multispecies FMP management unit.

Alternatives	Species with Medium/Highly Vulnerable EFH	Species with Highly Vulnerable EFH
	Sum*	**Sum***
3a	17.35	5.50
3b	17.25	5.41
4	18.40	5.75
5a	17.26	5.53
5b	17.64	5.26
5c	18.14	5.65
5d	14.39	4.57
6	16.01	4.67
10a	17.70	5.95
10b**	18.14	6.04

Table 157 – Relative Effectiveness of Amendment 13 Habitat Closed Area Alternatives in Protecting EFH for Two Categories of Species and Life Stages

**Values are total EFH area (in square nautical miles) per square nautical mile in each closed area for all moderately and highly vulnerable species and life stages in the Northeast region, and for only the highly vulnerable species and life stages.*

***Proposed measure*

Some of the alternatives are more effective at protecting moderately and highly vulnerable EFH per square nautical mile, notably 4, 5c, and 10b. The only alternatives that do not have a relative effectiveness score over 17 are Alternative 5d and Alternative 6. Alternatives 4, 10a, and 10b score the highest when comparing their effectiveness for protecting species with highly vulnerable EFH, while Alternatives 5d and 6 once again score the lowest (Table 157).

5.3.8.3.2.3 EFH-specific analysis: highly vulnerable New England-managed and overfished species

This analysis highlights area scaled EFH values for species with EFH that is highly vulnerable to mobile bottom-tending gears that are managed by the New England Council, and those that are overfished.

Species	Lifestage	OT Vuln.	SD Vuln.
American Plaice	A	High	High
Atlantic Cod	J	High	High
Haddock	A	High	High
Haddock	J	High	High
Ocean Pout	A	High	High
Ocean Pout	J	High	High
Ocean Pout	L	High	High
Ocean Pout	E	High	High
Red Hake	J	High	High
Redfish	J	High	High
Smooth Skate	A	High	High

Table 158 – Summary of those species managed by the New England Fishery Management Council with EFH deemed highly vulnerable to mobile bottom tending gears.

Species	Lifestage	OT Vuln.	SD Vuln.
Atlantic Cod	J	High	High
Black Sea Bass	A	High	High
Black Sea Bass	J	High	High
Tilefish	A	High	Low
Tilefish	J	High	Low

Table 159 – Summary of overfished species with EFH that is highly vulnerable to mobile bottom tending gears.

Alternatives	New England Species with Highly Vulnerable EFH	Overfished Species with Highly Vulnerable EFH
	Sum*	**Sum***
3a	5.50	0.74
3b	5.41	0.73
4	5.75	0.76
5a	4.95	0.85
5b	4.90	0.80
5c	5.02	0.96
5d	4.15	0.76
6	4.60	0.63
10a	5.90	0.75
10b**	5.98	0.76

Table 160 - Relative Effectiveness of Amendment 13 Habitat Closed Area Alternatives in Protecting EFH for Two Categories of Species and Life Stages.

**Values are total EFH area (in square nautical miles) per square nautical mile in each closed area, for the highly vulnerable species and life stages in New England, and for highly vulnerable species in the Northeast region.*
*** Proposed measure*

Alternatives 10a and 10b rank the highest in terms of their effectiveness for protecting New England species with highly vulnerable EFH. The only alternative that ranks much lower than the rest for relative effectiveness of protecting these species is Alternative 5d. Alternative 5c ranks the highest for protecting overfished species with highly vulnerable EFH. Alternative 6 ranks the lowest in this category (Table 160).

5.3.8.3.2.4 Analysis of closed area metrics associated with highly vulnerable EFH

Methodology

Table 161 summarizes the habitat and ecological characteristics for benthic life stages of nine species with EFH that is highly vulnerable to disturbance by at least one of the three mobile bottom-tending gears used in the Northeast region (see Table 156), based upon the analysis contained in Section 9.3.2. This information was used to select metric components for an evaluation of environmental features that are associated with these species, which would be protected by each of the ten proposed habitat closures.

Species	Lifestage	Depth (m)	Sediments	Guild	Assemblage
American Plaice	A	45-150	sand or gravel	Benthic	Pringrd, Demersal
Atlantic Cod	J	10-150	rocks, pebble, gravel	Ampshr	Pringrd, Demersal
Black Sea Bass	A	20-50	structures, sand and shell		Demersal
Black Sea Bass	J	1-38	rough bottom, shell and eelgrass beds, structures and offshore clam beds in winter		Demersal
Haddock	A	35-100	pebble gravel	Benthic	Prngrd, Demersal
Haddock	J	40-150	broken ground, pebbles, smooth hard sand, smooth areas between rocky patches	Benthic	Pringrd, Demersal
Ocean Pout	A	<110	soft sediments	Benthic	Demersal
Ocean Pout	J	<80	smooth bottom near rocks or algae	Benthic	Demersal
Ocean Pout	L	<50	close to hard bottom nesting areas	Benthic	Demersal
Ocean Pout	E	<50	hard bottom, sheltered holes	Benthic	Demersal
Red Hake	J	<100	shell and live scallops	Ampshr	Demersal
Redfish	J	25-400	silt, mud, or hard bottom	Shrfis	Pringrd, Demersal
Smooth Skate	A	31-874 mostly 110-457	soft mud, sand, broken shells, gravel and pebbles	Shrfis	Elasmo, Demersal
Tilefish	A	76-365	rough, sheltered bottom		Demersal
Tilefish	J	76-365	rough, sheltered bottom		Demersal

Table 161 – Summary of habitat and ecological characteristics of species and life stages with EFH that is highly vulnerable to bottom tending mobile gear

Of the 15 species and life stages listed above with highly vulnerable EFH, 12 are associated with rough, sheltered, hard, pebbled or broken bottom types. The list includes 7 benthivores, 4 shrimp-fish eaters and 2 amphipod eaters. Every species and life stage listed falls under the demersal and, in six cases, also the principle groundfish assemblage. Based on these results, two substrate types, three trophic guilds, and two species assemblages were selected for this analysis. Percent composition data for these habitat metric components are presented in Table 162 through Table 164, along with summed percentages to indicate the overall importance of each habitat characteristic.

Substrates

	Bedrock	Gravel	Sum
3(a)	1%	6%	7%
3(b)	1%	7%	8%
4	1%	6%	7%
5(a)	0%	1%	1%
5(b)	0%	1%	1%
5(c)	0%	1%	1%
5(d)	0%	1%	1%
6	0%	2%	2%
10(a)	0%	4%	4%
10(b)*	0%	4%	4%

Table 162 – Percent composition of substrate types associated with species with highly vulnerable EFH within each closed area

**Proposed measure*

Note: "Gravel" substrate is defined to include granules, pebbles, cobbles, and boulders.

Trophic Guilds

	Benthic	Ampshr	Shrfis	Sum
3(a)	42%	11%	24%	77%
3(b)	42%	11%	23%	76%
4	43%	11%	23%	77%
5(a)	26%	14%	17%	58%
5(b)	33%	14%	6%	53%
5(c)	32%	15%	9%	56%
5(d)	28%	8%	12%	48%
6	36%	14%	26%	76%
10(a)	43%	8%	29%	80%
10(b)*	43%	8%	31%	82%

Table 163 – Percent composition of trophic guilds associated with species with highly vulnerable EFH within each closed area

**Proposed measure*

Species Assemblages

	Pringrd	Demersal	Sum
3(a)	22%	49%	71%
3(b)	21%	49%	70%
4	22%	49%	71%
5(a)	11%	47%	59%
5(b)	9%	47%	56%
5(c)	11%	47%	58%
5(d)	11%	45%	56%
6	15%	49%	64%
10(a)	17%	49%	66%
10(b)*	17%	49%	66%

Table 164 – Percent composition of species assemblages associated with species with highly vulnerable EFH within each closed area

**Proposed measure*

Results
Closed area alternatives 3a, 3b, 4, 6, 10a, and 10b rank higher than any of the alternative 5 options for all three habitat metrics. For substrate, alternatives 3a, 3b, and 4 contain a higher percentage of rocky bottom, followed by alternatives 10a and 10b. Alternative 6 has about the same amount of rocky substrate as either of the alternative 10 options, but has a reduced percentage composition due to its larger size. For trophic guilds, alternatives 10a and 10b score slightly higher than alternatives 6, 3a, 3b, or 4. For species assemblages, alternatives 3a, 3b, and 4 score slightly higher due to the higher percentages of principal groundfish species.

5.3.8.3.3 Results of Closed Area Analyses

5.3.8.3.3.1 Alternative 3 - Closed areas designed to protect hard-bottom habitats

Alternative 3 was intended to protect complex hard-bottom and other sensitive and complex benthic habitats. This alternative includes two closed area options: 1) Alternative 3(a), with a larger extension of the WGOM to the west, and 2) Alternative 3(b), which has a smaller extension of the WGOM closure to the west. These extensions were explicitly designed by the EFH Technical Team in 1999 to include additional seafloor habitats inside the closed area. Alternative 3(b) includes two angular extensions from the western boundary to encompass additional gravel habitat on Stellwagen Bank as well as piled boulder features on Tillies Bank to the north. Alternative 3(a) extends the entire southwestern boundary of the closed area to include the previously mentioned features as well as the deep mud basins east, west and north of Tillies Bank. These alternatives originate from an analysis of the USGS multibeam map of the area and observations made using ROVs, submersibles, and video bottom cameras, as well as the accumulated field experience of the EFH Plan Development Team members.

Size and Substrate
Alternative 3(a) is slightly larger than Alternative 3(b), but the substrate compositions of the two alternatives are essentially the same (Table 139, Table 141 and Table 142). Either of these two options is larger than Alternative 4, about the same size as any of the Alternative 5 options and 10a and 10b, and smaller than Alternative 6. Alternatives 3a and 3b overlap 53% and 55% respectively with the existing groundfish closed areas (Table 140). Sand and gravelly sand account for about 70% of the sediment in Alternative 3 and mud for about 20% in these two alternatives (Table 142). The percent composition of rocky substrate (bedrock and gravel) and gravelly sand in Alternatives 3 and 4 is higher than in any of the other proposed habitat closures. Also, relative to the total area of each substrate type in the NAAA, these two options include higher percentages of rocky substrate and gravelly sand than any of the other habitat closed area alternatives (Table 141).

EFH
Because they are intermediate in size, Alternatives 3a and b contain a higher percentage of EFH area for species with the moderately (M) and highly (H) vulnerable EFH than Alternative 4, and a lower percentage than Alternative 6 (Table 143). Compared to the four Alternative 5 closed area options, which are very similar in size to the Alternative 3 options, total EFH area in 3a and b is lower than in options 5a, b, and c, but higher than 5d. On a per unit area basis, the total percent EFH value for the same species and life stages is very similar in Alternatives 3a, 3b, 5a and b (Table 157). The total area scaled M/H vulnerable EFH values are not quite as high as in Alternative 5c, but are notably higher than in Alternatives 5d or 6 and lower than Alternatives 4, 10a and 10b. The results are very similar for most of the alternatives for the H vulnerable

species/life stages, with Alternatives 3a and 3b somewhere in the upper middle (Table 157). For highly vulnerable New England species, total scaled EFH values rank slightly higher in Alternatives 3a, 3b, and 4 than in Alternatives 5a, b, c or d and 6, and slightly less than Alternatives 10a and 10b (Table 160). For overfished and H vulnerable species, Alternatives 3a and b rank lower than most in terms of total EFH per nautical mile (Table 160) because only one of the three species (juvenile cod) in this category is a New England species. Because the footprints of Alternatives 3a and 3b are so similar, the percentages of EFH area inside them are also very similar for virtually all species analyzed (Table 143). Species and life stages with high amounts of vulnerable EFH (over 10 percent) in Alternatives 3a and 3b are cod (A, J), haddock (A,J), halibut (A,J), pollock (A), and smooth skate (A).

Alternatives 3a and b, along with alternatives 4, 6, 10a and 10b, rank high in terms of the environmental characteristics that are associated with the 15 species and life stages with EFH that was determined to be highly vulnerable to the adverse effects of mobile, bottom-tending fishing gear (see Section 5.3.8.3.2.3). This conclusion is based on the high rankings for rocky bottom (Table 162), the benthivore, amphipod-eating, and shrimp and fish-eating trophic guilds (Table 163), and the principal groundfish and demersal finfish species assemblages (Table 164).

Ecosystem Effects: Trophic Guilds, Species Assemblages and Indicator Species
Alternatives 3a and b contain a higher biomass of benthivores than any of the other trophic guilds (Table 149). The percentage composition of benthivores in 3a/b is high (>40%), just as high as in alternatives 4, 10a and 10b (Table 150). Shrimp and fish-eating fish also make up a significant proportion (>20%) of the total biomass of the five trophic guilds in alternatives 3a and b. Alternatives 3a and b contain higher percentages of the benthivore and shrimp and fish-eating guilds than the alternative 5 options, but lower percentages than alternatives 10a and 10b (Table 150). The biomass values and percentages for the other three trophic guilds were fairly low in 3a/b (and 4) compared to the other alternatives. The demersal finfish assemblage, because it includes so many species, dominates the total biomass of all five species assemblages in each closure alternative, accounting for almost 50% of the total biomass in 3a and b (Table 152). Principal groundfish and elasmobranch species assemblages are also important components in Alternatives 3a and b, each accounting for >20% of the biomass. Of the six individual benthic species that were analyzed, redfish accounted for >50% of the total biomass in Alternatives 3a and b, and longhorn sculpins for >20% (Table 155). Redfish biomass is fairly high in Alternatives 3a and b, but not nearly as high as in alternatives 6, 10a and 10b.

Summary
In summary (Table 166), the two alternative 3 options would close five discrete areas on Georges Bank and in the Gulf of Maine with a total area that is intermediate in size (compared to the other eight alternatives). This alternative would offer new habitat protection in open access areas as well as maintain protection to benthic habitats in a considerable portion of the existing groundfish closed areas. There is a higher percentage of higher value rocky bottom in these two areas than in any of the other proposed closures except alternative 4. For species and life stages with EFH that is moderately or highly vulnerable to mobile, bottom-tending fishing gear, the EFH value of Alternative 3 is moderate. Biomass indices for bottom feeding and bottom dwelling fish are high. Summed across eight metrics, alternatives 3a and 3b have slightly higher habitat value than the other eight closed area alternatives.

5.3.8.3.3.2 Alternative 4 - Closed areas designed to protect hard-bottom habitats

Alternative 4 identifies five discrete habitat closed areas within a proposed (but rejected) groundfish rebuilding closed area option in this Amendment (Rebuilding Alternative 1). Much of the area specified in habitat closed area Alternative 3 would be included in this alternative. However, this alternative excludes an area between Closed Area I and the Nantucket Lightship Closed Area that was recommended by the Habitat Technical Team for habitat protection purposes (see Figures 17 and 18). Also, an area in the northern Gulf of Maine (Jefferys Bank) and areas west of the existing Western Gulf of Maine Closed Area that are included in Alternative 3 are not included in Alternative 4. The proposed Cashes Ledge Closed Area is also shaped a little differently.

Size and Substrate

Alternative 4 is the smallest of the ten proposed habitat closed areas (2,241 nmi2) and 69% of the area in this alternative overlaps with the existing year-round groundfish closed areas (Table 140). There is a 55% overlap with portions of the groundfish closures that have remained closed since they were first established and a 14% overlap with areas that were opened to scallop dredging in 1999 and 2000. Because there is a high degree of overlap between alternatives 3 and 4, the substrate composition is very similar in both alternatives. Sand and gravelly sand account for almost 75% of the substrate in Alternative 4 and mud for 15% (Table 142). The percent composition of rocky substrate and gravelly sand in Alternatives 3 and 4 is much higher than in any of the other proposed habitat closures. Because it is smaller, Alternative 4 contains a little less rocky substrate and gravelly sand than Alternatives 3a and b and accounts for lower percentages of the total amount of these substrate types in the NAAA (Table 142).

EFH

Largely because of its small size, Alternative 4 contains a lower percentage of total EFH area for species with moderately (M) and highly (H) vulnerable EFH than any other proposed habitat closure (Table 143). On a per unit area basis, the total EFH value for M/H vulnerable species and life stages is the highest for Alternative 4 , with alternatives 5c and 10b close behind (Table 157). Alternative 4 also ranks high for the relative effectiveness of protecting highly vulnerable species EFH, slightly less than Alternatives 10a and 10b. For highly vulnerable New England species, total scaled EFH values rank slightly higher in Alternatives 3a, 3b, and 4 than in Alternatives 5a, b, c or d and 6, and slightly less than Alternatives 10a and 10b (Table 160). For overfished and H vulnerable species, Alternative 4 ranks somewhere in the middle in terms of total EFH (Table 160) because only one of the three species (juvenile cod) in this category is a New England species. Species and life stages with high amounts of vulnerable EFH (over 10 percent) in this area are cod (A, J), haddock (A,J), halibut (A,J), pollock (A), and smooth skate (A).

Alternatives 3a and 3b and 4 rank high than the in terms of all the environmental characteristics that are associated with the 15 species and life stages with EFH that were determined to be highly (H) vulnerable to the adverse effects of mobile, bottom-tending fishing gear (see Section 5.3.8.3.2.3). This conclusion is based on the high rankings for hard bottom and coarse sediments (Table 162), the benthivore, amphipod-eating, and shrimp and fish-eating trophic guilds (Table 163), and the principal groundfish and demersal finfish species assemblages (Table 164).

Ecosystem Effects: Trophic Guilds, Species Assemblages and Indicator Species

The distribution of biomass among trophic guilds in Alternative 4 is very similar to Alternatives 3a and 3b, i.e., 43% benthivores and 23% shrimp and fish-eating fish and planktivores (Table 150). Alternative 4 contains a slightly lower percentage of total benthivore and shrimp and fish-eaters biomass than Alternatives 3a/b and considerably less than alternatives 6, 10a, and 10b

(Table 149). Percent of total amphipod-eaters biomass is also lower in Alternative 4 than in alternatives 3a, 3b, 6 and 10a, and the same as in 10b. The percentage biomass values for the other two trophic guilds were lower in Alternative 4 than in all the other alternatives. The composition of the five species assemblages in Alternative 4 is also very similar to what it is in Alternatives 3a and b. The demersal finfish assemblage accounts for almost 50% of the total assemblage biomass in Alternative 4, with principal groundfish and elasmobranchs each making up >20% (Table 153). Alternative 4 accounts for a lower percentage of the total biomass of principal groundfish in the NAAA than Alternatives 6, 10a and 10b and the two Alternative 3 options, but more than any of the Alternative 5 options (Table 152). As is the case in alternatives 3a and 3b, redfish accounted for >50% of the total individual species biomass in Alternative 4, and longhorn sculpins for >20% (Table 153). The percentage of total redfish biomass in Alternative 4 (and 3a/b) is higher than in any of the Alternative 5 options and lower than in Alternatives 6, 10a and 10b (Table 152).

Summary

In summary (Table 166), Alternative 4 would close five discrete areas on Georges Bank and in the Gulf of Maine with a total area that is smaller in size than any of the other proposed habitat closure alternatives. This alternative would offer new habitat protection in open access areas as well as maintain protection to benthic habitats in a considerable portion of the existing groundfish closed areas. There is a higher percentage of rocky bottom in this area than in any of the other proposed closures except alternatives 3a and 3b. For species and life stages with EFH that is moderately or highly vulnerable to mobile, bottom-tending fishing gear, the total EFH area that is contained within this alternative is low, but after scaling for its small size, its EFH value is intermediate. Biomass indices for bottom feeding and bottom dwelling fish are high. Summed across eight metrics, Alternative 4 has a slightly lower habitat value than alternatives 3a, 3b, 10a, and 10b, but higher than any of the Alternative 5 options.

5.3.8.3.3.3 Alternative 5 - Closed areas designed to protect EFH and balance fishery productivity

Alternative 5A: EFH/Productivity tradeoffs using the original working group species EFH weights with equal emphasis given to scallop productivity and the combined weighted productivity of 37 other managed species.

Alternative 5B: Total EFH value only, using revised species EFH weights (omitting relative importance to the fishery as a factor), with no productivity tradeoff.

Alternative 5C. EFH/Productivity tradeoffs using the revised species EFH weights with equal emphasis given to scallop productivity and the combined weighted productivity of the other 37 managed species.

Alternative 5D. EFH/Productivity tradeoffs using the revised species EFH weights and productivity for each of the 37 managed species, considered individually.

A distinguishing characteristic of the proposed habitat closed areas in Alternative 5 is the fact that they are empirically derived from 30 years of trawl survey data for a large number of species (37) (see Appendix XI). Each alternative proposes to close five areas of similar size, one in each of five “eco-regions.” The location of the individual closed areas varies among the four options, but the total area that would be closed under each option is very similar. Because these four closure options were developed without any reference to existing closed areas, only a small fraction of the proposed closed areas overlap with the existing groundfish closed areas. All four alternatives include a closed area in southern New England and the Mid-Atlantic Bight: all of the other habitat closed area alternatives are restricted to Georges Bank and the Gulf of Maine.

Size and Substrate
The overall area that would be closed in each alternative is very similar, roughly 3,022 – 3,098 nmi² (Table 139). The options under Alternative 5 overlap very minimally with the existing year round groundfish closed areas, respectively: 5%, 5%, 0% and 6% (Table 140). Alternative 5c is located entirely outside of these closures. Alternative 5b is the only one that overlaps with any of the areas that were opened to scallop dredging during 1999 and 2000. The substrate compositions of each alternative vary considerably (Table 141 and Table 142). For example, Alternative 5(b) will protect significantly more gravelly sand and sand than the other options in Alternative 5, whereas 5(a) and 5(c) will protect more mud than 5(b) and 5(d). Alternatives 5(a) and 5(c) also protect more mud than any of the other alternatives and 5(a) and 5(d) score the highest for muddy sand. The amount and percentage of rocky bottom in these alternatives is very low.

EFH
The un-scaled percent of total EFH area values for Alternatives 5a-c are higher than the EFH values for Alternatives 3a/b and 4 and lower than for Alternative 6 and about the same as 10a and b (Table 143). The un-scaled EFH value for 5(d) is lower than the other Alternative 5 options, but is still higher than Alternative 4. The total scaled EFH value for M/H vulnerable species and life stages in Alternative 5(c) is high and for 5(d) is lower than all the other alternatives (Table 157). Values for 5a/b are intermediate. Alternatives 5a-c rank somewhere in the middle in terms of EFH protection for highly vulnerable species/life stages, and Alternative 5d ranks last . For highly vulnerable New England species, Alternatives 5a-d rank toward the bottom half of the alternatives (Table 160). On the other hand, these alternatives rank high for overfished and H vulnerable species, especially 5(c). Species that exceed 10% of total EFH area in any of the alternative 5 closure options are cod (J) and haddock (J) in 5b, plaice (J) in 5a and 5c, ocean pout (J) in 5a and b, and smooth skate (A) in 5a, b, and c. None of the species with M/H vulnerable EFH reached this EFH value in 5d.

None of the Alternative 5 closed area options rank nearly as high as the other habitat closed area alternatives in terms of the environmental characteristics that are associated with the 15 species and life stages with EFH that is highly (H) vulnerable to the adverse effects of mobile, bottom-tending fishing gear. Alternatives 5b and 5d score slightly below 5a and 5c for guilds and assemblages (Table 163-Table 164). Assemblage scores for all four Alternative 5 options were very similar. The analysis of substrate data revealed very little rocky bottom in any of these proposed closed areas.

Ecosystem Effects: Trophic Guilds, Species Assemblages and Indicator Species
The dominant trophic guilds in the four Alternative 5 options are benthivores and planktivores (Table 150). Planktivore biomass in these four alternatives is higher than in the other closed area options, but absolute biomass indices for the other guilds are low (Table 143). Shrimp and fish-eater biomass is especially low in 5b and c. Benthivore biomass is also lower in all the Alternative 5 options than in any of the other alternatives. The biomass values for amphipod-eaters and piscivores are comparable to the other alternatives. Elasmobranchs and demersal finfish species account for most of the species assemblage biomass in the four Alternative 5 closed area options (Table 153). Principal groundfish species only make up 9-11% of the total assemblage biomass (compared to 21-22% in Alternative 3). Pelagic species are more abundant in

the Alternative 5 area closures. Individual Alternative 5 closures with high percent-of-total biomass values are 5b (elasmobranchs, principal pelagics, and demersal species), and 5d (principal pelagics) (Table 152). Of the six individual benthic species that were analyzed, redfish, ocean pout, and longhorn sculpins account for most of the total biomass in Alternative 5(a), sculpins in 5(b), sculpins, and ocean pout in 5(c), and redfish and ocean pout in 5(d) (Table 154 and Table 155). Lobsters were more abundant in 5b and c than in any of the other alternatives. Relative to total biomass of each species in the NAAA, the biomass of sculpins in 5b and c is higher than in any of the other alternatives. The same is true for sea ravens in 5b, ocean pout in 5d, jonah crabs in 5a and d, and lobsters in 5c.

Summary
These alternatives would almost exclusively new habitat protection in open access areas without continuing any significant continued protection within the existing groundfish closed areas (Table 166). Protection of high value rocky substrate would be negligible. None of the Alternative 5 closed area options rank nearly as high as the other habitat closed area alternatives in terms of the environmental characteristics that are associated with the 15 species and life stages that are highly (H) vulnerable to the adverse effects of mobile, bottom-tending fishing gear (See Gear Effects Evaluation and Adverse Impacts Determination Sections). Alternative 5(b) ranks higher for sediments and slightly less than 5(a) for guilds and assemblages (Table 162-Table 164). Assemblage scores for all four Alternative 5 options were very similar. Biomass indices for bottom feeding and bottom dwelling fish are intermediate for all four options. Summed across eight metrics, none of the Alternative 5 options rank as high as the other six closed area alternatives.

5.3.8.3.3.4 Alternative 6 - Closed Areas consistent with the FW 13 Scallop Closed Area Access Program

This alternative is consistent with the Controlled Area Access Program under Framework 13 to the Scallop FMP. By allowing mobile, bottom-tending gear to operate in the FW 13 scallop access areas, but not in the remaining 80% of the existing groundfish closed areas, the Council will be able to integrate scallop and groundfish habitat management measures more effectively. However, these areas were not originally closed to protect habitat, and were not identified as areas with high habitat value, this alternative may not minimize the habitat effects of fishing as effectively as other habitat closure alternatives that are designed for that purpose.

Size and Substrate
This alternative is larger (4,041 nmi²) than any of the other habitat alternatives and overlaps entirely with all portions of the three existing groundfish closed areas on Georges Bank that have been off-limits to groundfish gear (including scallop dredges) since these closures were established in December 1994, as well as the entire Western Gulf of Maine groundfish closed area, which was established in May 1998 (Table 139 and Table 140). For this reason, all bottom habitats contained within this alternative have been un-disturbed by groundfish trawls and scallop dredges (but not clam dredges and shrimp trawls) for 5-9 years. (See Section 4.3.6.1.2 for a detailed description of fishing activity that occurred within these four areas during 1998-2001 by gears that are exempted from the groundfish closed area regulations). Over 60% of the area is sand, with 16% gravelly sand, 10% muddy sand, and 10% mud (Table 142). Even though only 2% of the area is “gravel” (rocky bottom), it accounts for 17% of all the gravel in the NAAA (Table 141). Thus, in terms of rocky substrate, this alternative ranks below Alternatives 3 and 4, above all the Alternative 5 options, and about the same as Alternatives 10a and 10b.

EFH
Because it larger than the other closure alternatives, total and percent-of-total EFH area designated for all the species and life stages with moderately (M) and highly (H) vulnerable EFH within Alternative 6 is higher than in any of the other closed area alternatives (Table 143). On a per-unit-area-basis, however, the total EFH value for these species and life stages is relatively low (Table 157). Alternative 6 has a low area-scaled EFH value for all species with H vulnerable EFH, for New England species with H vulnerable EFH, and for overfished species with H vulnerable EFH (Table 157 and Table 160). Species with high amounts of vulnerable EFH (>10%) are cod (A, J), haddock (A,J), halibut (A,J), ocean pout (A), barndoor skate (A,J), smooth skate (A), winter flounder (A), and yellowtail flounder (A).

The Alternative 6 closed area option ranks below Alternatives 3a/b and 4 in terms of the substrates that are associated with the 15 species and life stages with EFH that is highly (H) vulnerable to the adverse effects of mobile, bottom-tending fishing gear (Table 162). This alternative ranks fairly high for high priority trophic guilds (Table 163) and species assemblages (Table 164), and although not as high as 10a and 10b.

Ecosystem Effects: Trophic Guilds, Species Assemblages and Indicator Species
The amphipod-eaters, benthivore, and shrimp and fish-eaters guilds are well represented in the proposed Alternative 6 closed area (Table 150). Owing primarily to its large size, this alternative contains higher percent-of-total biomass values for the piscivore, amphipod, and shrimp/fish eaters guilds than any of the other alternatives (Table 149). Elasmobranchs and demersal finfish species account for most of the species assemblage biomass in Alternative 6 (Table 153). Principal groundfish species make up 15% of the total assemblage biomass (compared to 21-22% in Alternatives 3 and 4) and pelagic species are not abundant. Again, due to its large size, this alternative accounts for the highest percent-of-total biomass values for the elasmobranchs, principal groundfish, and demersal finfish species (Table 152). Of the six individual benthic species that were analyzed, redfish account for 66% of the total biomass in Alternative 6 (Table 155). Relative to the total biomass of each species in the NAAA, the biomass values for redfish, longhorn sculpins, and sea ravens are fairly high (Table 154).

Summary
Alternative 6 would close five discrete areas on Georges Bank and in the Gulf of Maine with a total area that is larger than any of the other proposed habitat closure alternatives (Table 166). All of the habitat protection provided by this alternative would be in portions of the existing groundfish closed areas that have remained closed to most forms of mobile, bottom-tending fishing since these closures were first established 5-9 years ago. Most of the bottom in these areas is sandy; rocky bottom is of intermediate extent compared with the other alternatives. For species and life stages with EFH that is moderately or highly vulnerable to mobile, bottom-tending fishing gear, the total EFH area that is contained within this alternative is high, but after scaling for its large size, its EFH value is low. Biomass indices for bottom feeding and bottom dwelling fish are high. Summed across eight metrics, Alternative 6 has a high habitat value.

5.3.8.3.3.5 Alternative 10 – Compromise Habitat Closure Areas (Proposed Measure)

This action identifies several areas as habitat closures. This alternative was developed to incorporate areas that would benefit EFH, but not in the most productive fishing grounds currently available to fishermen. Both existing mortality closures and proposed habitat closures were modified to develop one alternative that closes sensitive habitat. In general, the alternatives suggest changing the eastern boundary of the Western Gulf of Maine closure, and modifying the

Nantucket Lightship closure. In addition, the access areas used in Framework 13 for Closed Area I were modified slightly. Lastly, the habitat closure proposals for Closed Area II, Jeffrey's, Bank, and Cashes Ledge were included in this alternative, with some modifications.

Size and Substrate

Alternatives 10a and 10b are very similar in size to most of the other habitat closed area alternatives (Table 139). Additionally both 10a and 10b overlap considerably (about 80%) with the existing groundfish closed areas, mostly in portions of the closures that were not opened to scallop dredging in 1999 and 2000 (Table 140). For this reason, the majority of bottom area contained within this alternative has been relatively un-disturbed by mobile, bottom-tending gear for 5-9 years. The seven discrete areas that make up these two alternatives are 58-60% sand, but there is a modest amount of mud and gravelly sand as well (Table 142). Even though only 4% of the area is gravel (rocky bottom), 19% of all the gravel in the NAAA is contained within these two alternatives (Table 141). The only alternatives that include more rocky bottom are 3a/b and 4.

EFH

Total percent EFH area values for all the M/H vulnerable species and life stages in these two alternatives are very similar to values in the other alternatives falling between the high value in alternative 6 and the low value in alternative 4 (Table 143). On a per unit area basis, Alternatives 10a and 10b rank higher than 3, 5b,c, and d, and 6 and lower than Alternative 4 for these species (Table 157). The EFH relative effectiveness scores for Alternatives 10a and 10b are the highest for species with highly vulnerable EFH, and New England species with highly vulnerable EFH. Alternatives 10a and 10b rank fairly low in terms of EFH protection for overfished highly vulnerable species (Table 160).

The Alternative 10 closed area option ranks below Alternatives 3 and 4 in terms of the substrates and species assemblages that are associated with the 15 species and life stages that are highly (H) vulnerable to the adverse effects of mobile, bottom-tending fishing gear but not in terms of trophic guilds (Table 162 and Table 163). Both options in Alternative 10 rank higher than any of the other Alternative 5 options for bottom sediments, trophic guilds and species assemblages (Table 162 through Table 164).

Ecosystem Effects: Trophic Guilds, Species Assemblages and Indicator Species

Both the benthic and shrimp/fish eaters guilds are well represented in the proposed Alternative 10 closures (Table 150). The percent-of-total biomass values for these two trophic guilds are considerably higher than for any of the other alternatives with the exception of Alternative 6 (Table 149). Elasmobranchs and demersal finfish species account for most of the species assemblage biomass in the two Alternative 10 options (Table 153). Principal groundfish species make up 17% of the total assemblage biomass (compared to 21-22% in Alternatives 3 and 4) and pelagic species are not abundant. Percent-of-total biomass values for elasmobranchs, principal groundfish, and demersal finfish species are high, but not as high as in Alternative 6 (Table 152). Of the six individual benthic species that were analyzed, redfish account for 74% of the total biomass in Alternative 10, more than in any of the other alternatives (Table 155). Relative to the total biomass of each species in the NAAA, the biomass values for the other five benthic species are low (Table 154).

Summary

These two alternatives are intermediate in size and are located mostly inside the existing groundfish closed areas (Table 166). They would both close approximately 500 nm^2 of open access area to bottom tending mobile gear mostly in an area south of Nantucket Island. These closures include some rocky substrate but not as much as Alternatives 3 and 4. Total and percent of total EFH values are intermediate, but the area scaled values are fairly high. The fish communities are composed primarily of bottom-feeding and bottom-dwelling fish. Overall, these alternatives have a high habitat value.

Habitat Metric	**Explanation**	**Low**	**Moderate**	**High**
Size	Area (nm^2)	2241	2637-3050	4038
Overlap A (Protection of open access areas)	Percent overlap with existing closed areas	>80%	57-69%	<10%
Overlap B (Continue existing closed area protection)	Percent overlap with non-FW 13 portions of closed areas	<10%	45-55%	>75%
Substrate	Percent rocky bottom	1-2%	4%	7-8%
Percent total EFH area[1]	Sum of EFH areas (nm^2) in closed area divided by total EFH area in NW Atlantic analysis area	5-5.4%	6.1-6.6%	7.8%
Per-unit-area EFH[1]	EFH areas (nm^2) in closed area divided by size of area, summed for all species	14.4-16%	17.2-17.7%	18.4%
Bottom feeders[2]	Sum of total biomass (wt/tow) in closed area divided by total biomass in NW Atlantic analysis area	NA	48-58%	76-82%
Bottom dwellers[3]	Sum of total biomass (wt/tow) in closed area divided by total biomass in NW Atlantic analysis area	NA	56-59%	64-71%

Table 165 - Criteria Used to Rank Habitat Metrics for Analysis of Habitat Closed Area Alternatives in Amendment 13

[1]*For species and life stages with moderately or highly vulnerable EFH*
[2]*For benthivore, amphipod-eaters, and shrimp/fish-eaters trophic guilds*
[3]*For principal groundfish and demersal finfish species assemblages*

Alternative	Size	Overlap A	Overlap B	Hard substrate	Percent EFH area	Per-unit-area EFH	Bottom feeders	Bottom dwellers
3a	Intermediate	Intermediate	Intermediate	High	Intermediate	Intermediate	High	High
3b	Intermediate	Intermediate	Intermediate	High	Intermediate	Intermediate	High	High
4	Low	Intermediate	Intermediate	High	Low	Intermediate	High	High
5a	Intermediate	High	Low	Low	Intermediate	Intermediate	Intermediate	Intermediate
5b	Intermediate	High	Low	Low	Intermediate	Intermediate	Intermediate	Intermediate
5c	Intermediate	High	Low	Low	Intermediate	High	Intermediate	Intermediate
5d	Intermediate	High	Low	Low	Low	Low	Intermediate	Intermediate
6	High	Low	High	Low	High	Low	High	High
10a	Intermediate	Low	High	Intermediate	Intermediate	Intermediate	High	High
10b	Intermediate	Low	High	Intermediate	Intermediate	Intermediate	High	High

Table 166 - Summary of Habitat Benefits of Proposed Amendment 13 Habitat Closed Area Alternatives

Overlap A: New protection in open access areas
Overlap B: Continue existing protection (overlap with existing groundfish closed areas)

5.3.9 Results of Non-Closed Area Habitat Analysis

5.3.9.1 Alternative 7 - Expand list of gears prohibited in closed areas

This alternative proposed to expand the list of fishing gears prohibited from use in the *existing year-round groundfish closed* areas to include shrimp trawls, herring mid-water trawls, clam dredges and pots and traps. These gear types are allowed in at least portions of the existing groundfish closed areas and, due to the nature of the gear and the potential for adverse impacts to groundfish habitat, it may be advantageous to prohibit these gears from use in these areas to better protect habitat. The Council selected to only list clam dredges as an additional fishing gear prohibited from use in the groundfish closed areas.

In some cases, when the gears originally considered under this alternative are used properly, no adverse impacts to habitat are expected (e.g. herring midwater trawls). When the gears are used improperly, however, adverse impacts may occur (e.g., herring trawls fishing on the bottom, tuna purse seines in contact with the bottom, etc.). Since it can be difficult to enforce regulations that the gear only be used properly, gear prohibitions may be an alternative to protect the habitat of the closed areas. In other cases, there may be inconclusive information on the nature of the effects some gears considered under this alternative may have on fish habitat.

This alternative could further reduce the potential for adverse impacts on EFH within the closed areas associated with these gear types. It is difficult to quantify any potential reductions, however, due to lack of data. Both the lobster and shrimp fisheries are exempt from the mandatory logbook data reporting and, as such, activity data for these fisheries is sparse (Figure 146 and Figure 148 detail what data is currently available). Very few herring trips occurring inside the closed areas appear in the VTR database; only vessels with limited access groundfish permits would be likely to report their herring landings via this route. Therefore, it is difficult to assess the actual activity levels for these gear types inside the closed areas and any consequent impacts they may have.

The clam trips reported to the VTR database in 2001 are depicted in Figure 164Figure 150. There were a number of clam dredge trips within the boundaries of the Nantucket Lightship closed area, particularly in the northwestern corner. Habitat Alternative 6 can be used as a proxy for the existing year-round groundfish rebuilding closed areas because it covers the same traditional fishing grounds affected by the Council's motion to exclude clam dredges from the groundfish closed areas. Table 299 describes the proportional loss of surf clam/ocean quahog landings (bushels) by state and habitat alternative. According to that table, the areas within Alternative 6 impact the largest percentage of clam/quahog landings (6.8%). It is probable that those vessels would shift outside the closed area, but efficiency may be reduced in those areas. Assuming no displacement, approximately 6.8% of the clam trips (based on fishing activity in 2001) would be impacted from this measure. It is important to note that all the impacts (40%) come from vessels homeported in Massachusetts; none of the other states with surf clam landings would be impacted from this restriction.

The vulnerability analysis (Section 9.3.1.3) concluded a low impact for all gears mentioned in this alternative with the exception of shrimp trawls (type of otter trawl) and hydraulic clam dredges, which have an adverse impact on EFH. Figure 163 and Figure 164 illustrate the discrete use of shrimp trawls and hydraulic clam dredges inside the current year-round groundfish closed areas where use is prevalent.

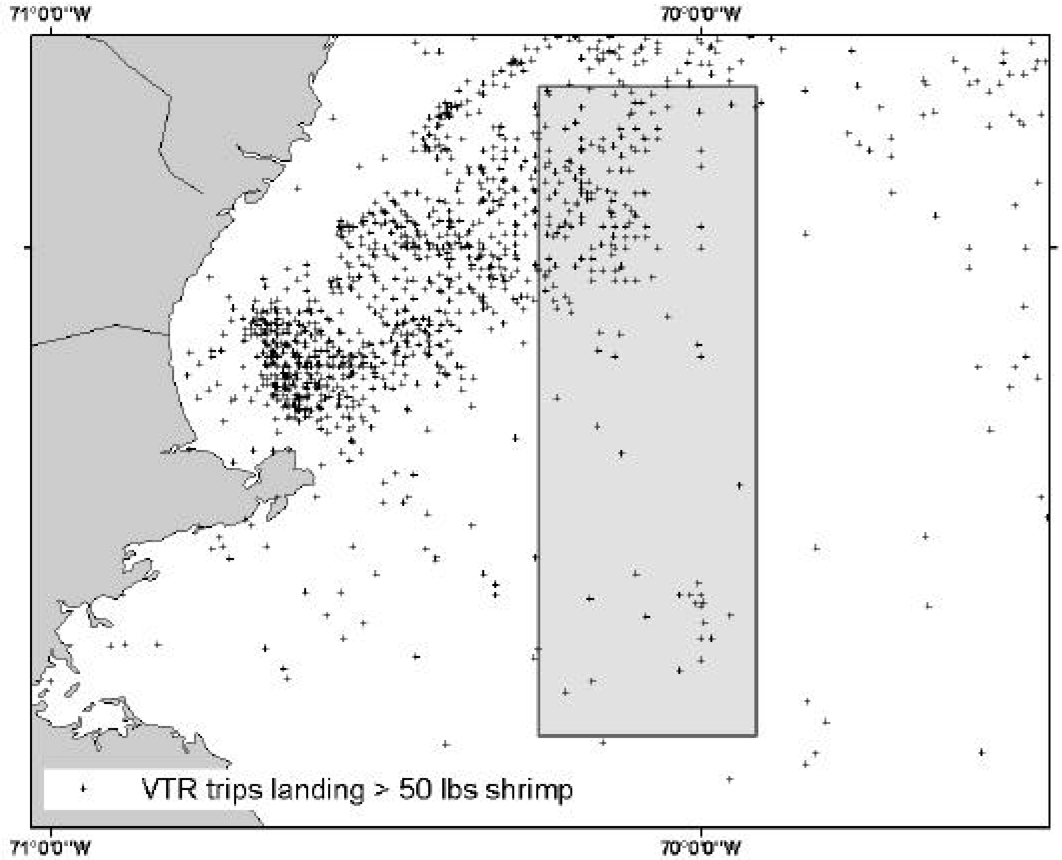


Figure 163 – Spatial distribution of shrimp trawl activity inside the existing year-round groundfish closed areas.

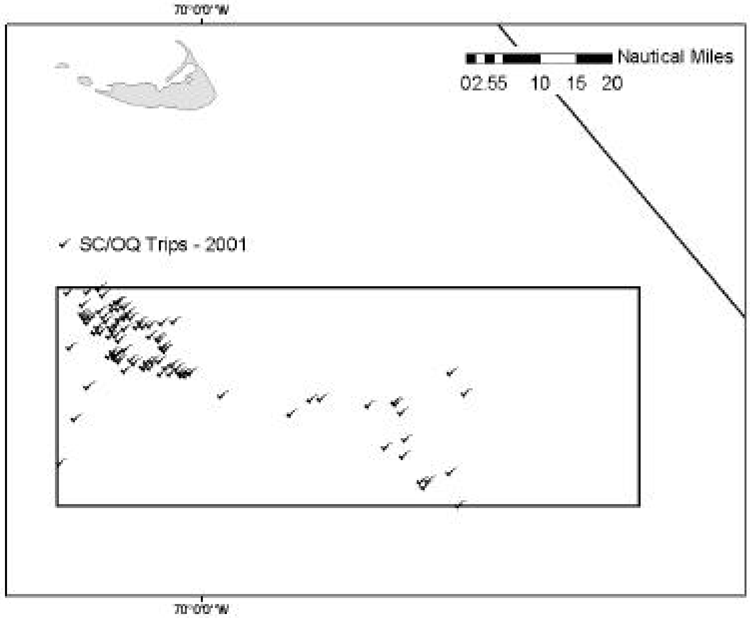


Figure 164 – Spatial distribution of clam dredge activity inside the existing year-round groundfish closed areas

The description of the EFH and environmental attributes within the existing groundfish closed areas (Closed Area I, II, Western Gulf of Maine and the Nantucket Lightship closure) have been evaluated under the No Action Habitat Alternative. Table 167 summarizes the sediment, EFH, and biomass information for these areas from the EFH metric analyses. This table has been extracted from several tables within Section 5.3.8.3.1. Keep in mind that this table summarizes all the closed areas combined, and the clam/quahog fishery only takes place within a portion of the Nantucket Lightship closure.

AREA	5,853 nm2					
SEDIMENT	Bedrock	Gravel	Gravely Sand	Sand	Muddy Sand	Mud
% of total	*0%*	*19%*	*25%*	*8%*	*6%*	*2%*
EFH	Refer to Table 143					
GUILD	Benthic	Ampshr	Plankt	Pisc	Shrifis	
% of total	*27*	*39*	*10*	*10*	*19*	
ASSEMBLAGE	Elasmo	Pringrd	Prinpel	Demersal	Pelagic	
% of total	*14*	*28*	*11*	*16*	*9*	
SPECIES	LhnScpn	SeaRavn	Redfish	OcPout	JonCrab	Lobster
% of total	*37*	*30*	*18*	*11*	*9*	*9*

Table 167 – Summary of the environmental attributes of the existing groundfish closed areas (No Action Habitat Alternative) that are consistent with the areas prohibited for Habitat Alternative 7.

5.3.9.2 Alternative 8 – Restrictions on the use of rockhopper and/or roller gear

Scoping comments received by the Council and NMFS suggested the Council should consider restricting the use of both rockhopper and roller trawl gear as a measure to minimize adverse impacts on habitat potentially associated with otter trawl gear. Although rockhopper and roller trawl gear function differently and may interact differently with benthic habitats, we have very little information with which to distinguish the effects of these gears on EFH. For the purposes of this analysis and consideration of management alternatives, these two gear types are considered together. If, as we get additional information on these gear types, we determine that their effects on EFH are different and can be distinguished, the Council would be able to manage rockhopper and roller gear separately.

The inshore restricted roller gear area

Rockhopper and roller gear are currently only managed in an area specified as the Inshore Restricted Roller Gear Area (Figure 165).

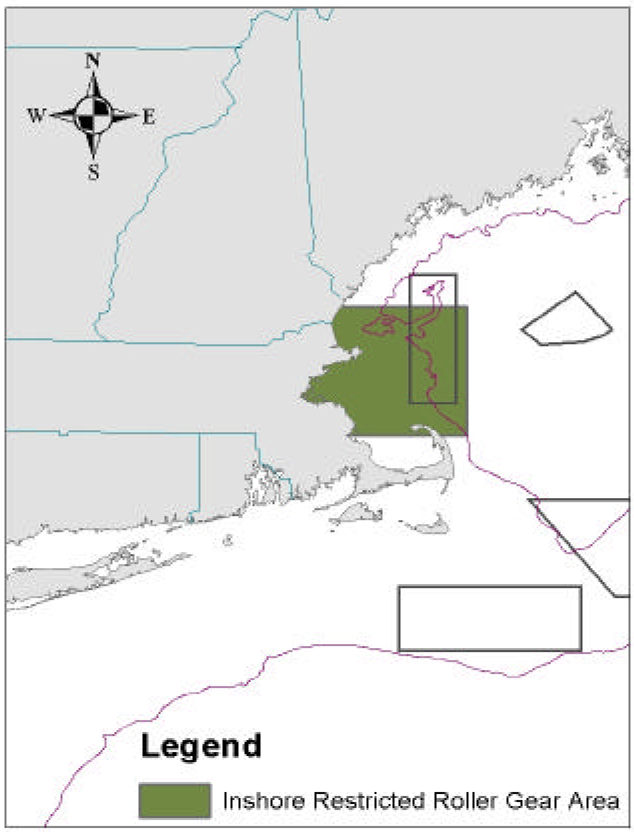


Figure 165 - Inshore restricted roller gear area, which imposes a 12 inch limit on roller gear

In this area, the diameter of any part of the trawl footrope, including discs, rollers, or rockhoppers, must not exceed 12 inches. Anecdotal evidence suggests that this restriction has had an impact on fishing behavior, keeping trawl vessels off of areas of high relief bottom. It has been further suggested that this has led to a reduction in fixed gear conflicts, as gillnet gear has been fished in the very rocky areas that trawlers can no longer access. There is no quantifiable evidence to support the anecdotal evidence, but the anecdotes do strengthen the comments received in scoping which indicate that limiting rockhopper size could have a very positive impact on sensitive high-relief bottom types.

Areas potentially impacted by limits on rockhopper or roller use

To assess the areas potentially affected by a restriction on roller/rockhopper gear, trawl survey data are analyzed. The trawl survey, which uses 16-inch rockhoppers and 4-inch cookies, includes a code for each trawl that indicates if a hang or snag occurred on that tow. Three levels of hang/snag are recorded: minor damage to the gear, requiring repairs; major damage to the gear, requiring extensive repairs; and, significant damage to the gear rendering it unusable for future tows. The position of the haulback from each tow reporting a hang/snag is plotted in the figures below. These data do not indicate or imply the cause of the snag or hang. They are intended instead to show areas of known high relief bottom, and to provide a picture of the general areas where roller gear and rockhoppers *may* be used.

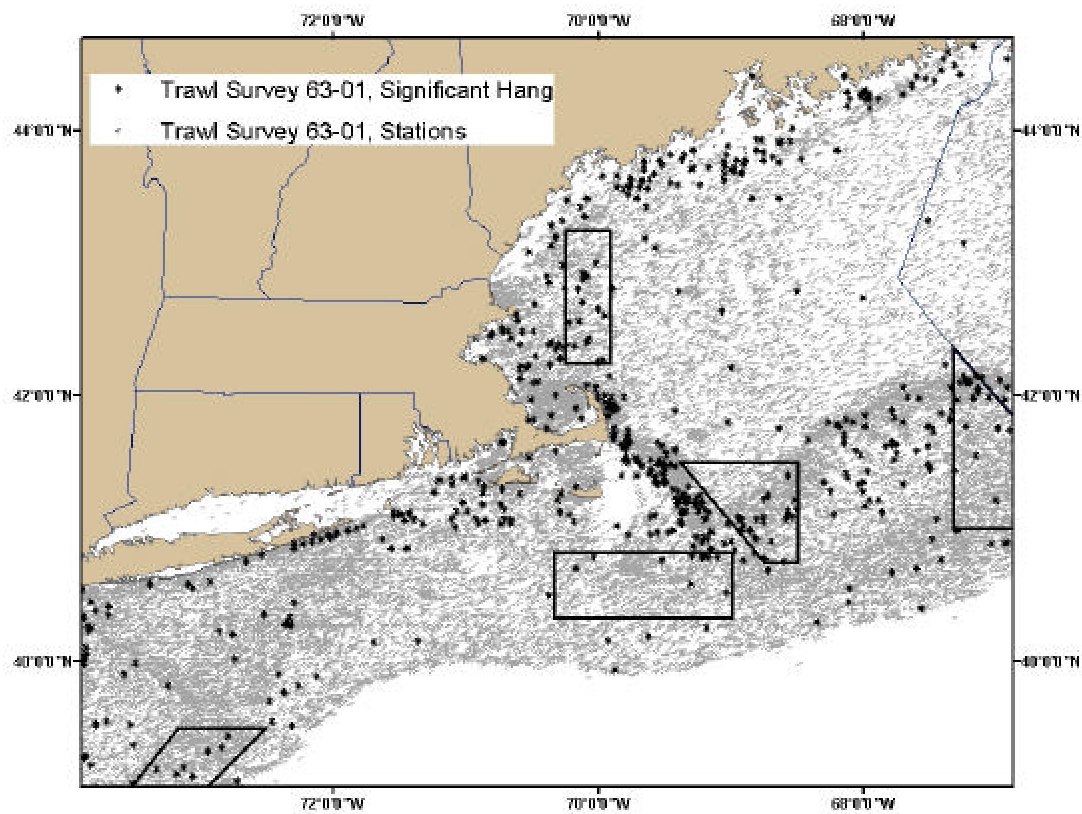


Figure 166 – All trawl survey stations 1963-2001 overlaid with locations of significant gear damage

Figure 166 shows the location and density of known hangs (using 16 inch rockhoppers). The positions in the background are the locations of all trawl surveys (sampling locations); these show the areas that are not sampled and those that are sampled less densely. To correlate these data with known high-resolution substrate data, the hangs were plotted with a two nautical mile buffer around each haul-back location which was then plotted with the Stokesbury and Harris (2002) data on known cobble and boulder locations (Figure 167 and Figure 168).

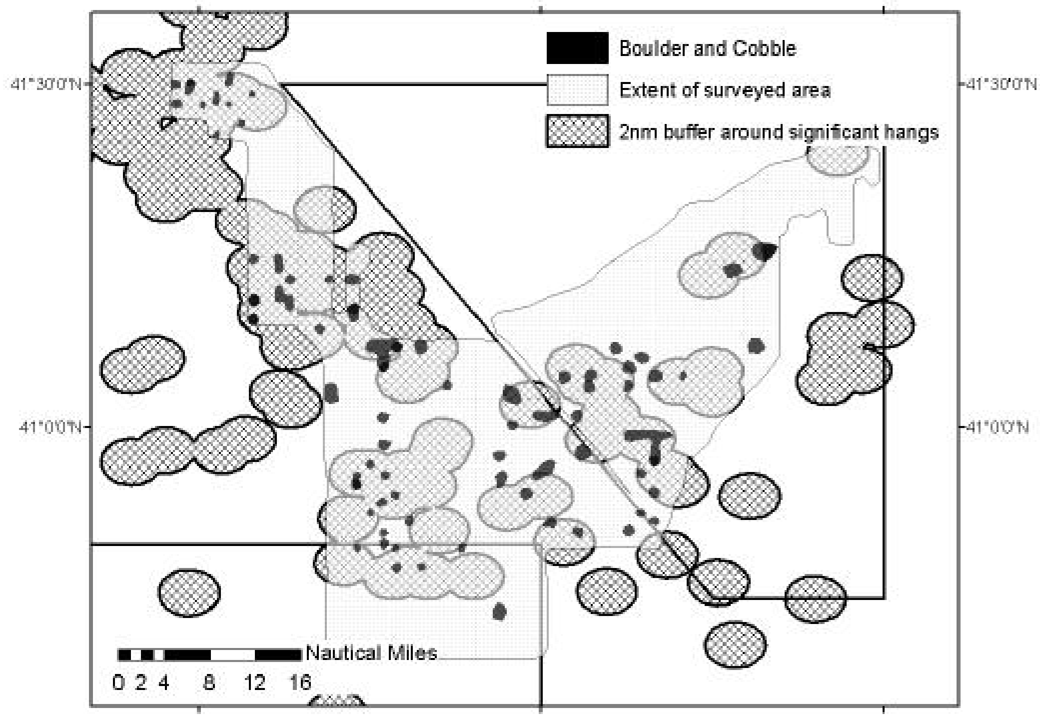


Figure 167 – 2nm buffer around significant hangs with sediment data, Nantucket Shoals area

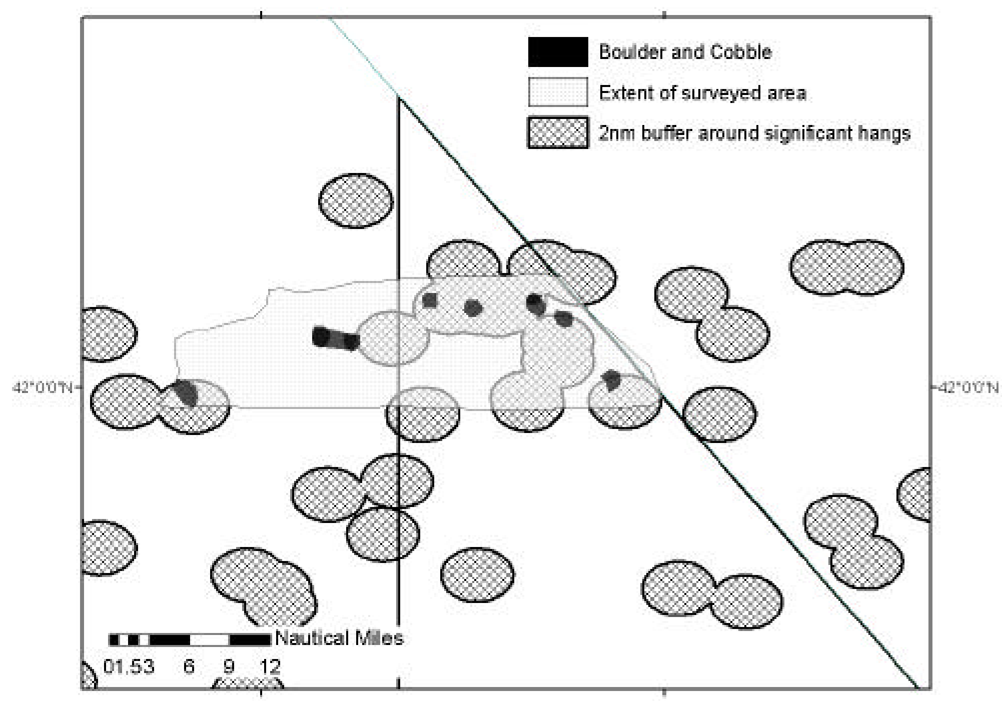


Figure 168 – 2nm buffer around significant hangs with sediment data, Northern Edge area

Visual inspection indicates a slight correlation between the existence of known cobble and boulder patches with the general vicinity in which a known hang occurred. Based on this, it is likely that the presence of clusters of known hangs is indicative of areas where rockhopper gear is employed.

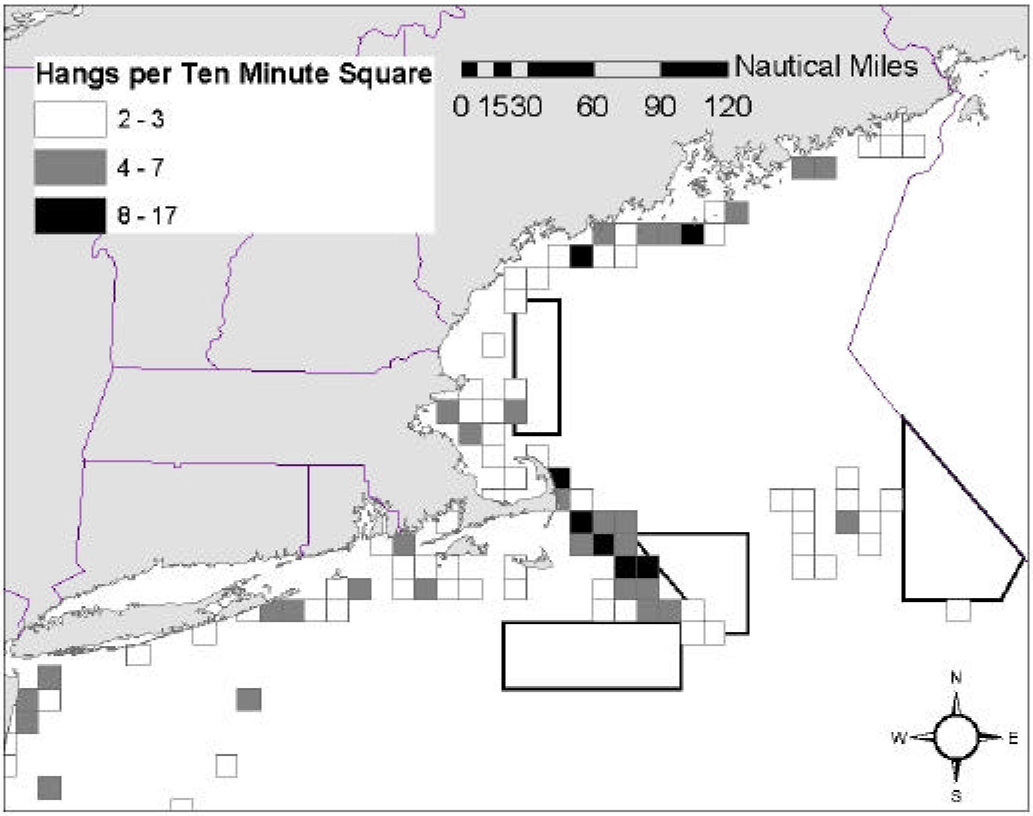


Figure 169 – Hangs per ten minute square

If this is the case, Figure 169 may capture the primary areas for use these gears (though, due to the geographic delineation of the binned data, some important areas are likely not represented). The total area encompassed inside these areas potentially affected by limits on rockhopper/roller gear is just over 4,800 sq nautical miles. *In no way does this imply that any specific amount of area will or may be off limits to fishing based on rockhopper restrictions.* It is simply a way to quantify the amount of area that *could* be impacted if restrictions are enacted.

Given that this area, based on trawl survey hangs (16 inch rockhoppers), is likely to include a large percentage of the high-relief bottom found in the traditional fishing grounds, and coupled with the anecdotal evidence which suggests a move away from high relief bottom in the Inshore Restricted Roller Gear Area (12 inch rollers), a significant habitat benefit may result from restrictions on rockhopper gears below 16 inches.

If the Council determines it is advantageous to implement some form of restrictions on the use of rockhopper and roller trawl gears, the following represent a range of alternatives from least restrictive to most restrictive.

5.3.9.2.1 Alternative 8(a) - Prohibition on the use of any rockhopper and roller trawl gear with a diameter larger than the current maximum size (estimated to be between 31” and 36”).

The intention of this alternative is to freeze the maximum size of rockhopper and roller trawl gear at the maximum size currently in use. It is estimated that the maximum size rockhopper and roller trawl gear currently being used in the New England region is in the range of 31” to 36” in diameter. To determine the actual current maximum size, the Council would contact fishermen and gear distributors in the New England region and assess the largest size rockhopper and roller gear that they currently use or stock and sell. Once the maximum allowable size is capped, the Council and NMFS would be able to direct research and information collection to explore and document the specific effects of various sizes of rockhopper and roller trawl gear on the variety of important groundfish habitats. The Council would use this new information to determine if the maximum allowable size should be further reduced, maintained at current levels, or the size restriction eliminated altogether. This research would also target the differences between rockhopper and roller gear, and whether differential size restrictions would be the most appropriate management tool to minimize the effects of these gear types on EFH.

This alternative would have no effects on current fishing practices, although it would provide time for the Council to collect information and assess the effects of different sizes of rockhoppers and rollers currently in use. This alternative would protect areas not currently accessible with mobile gear from being fished in the future until the Council is able to make a determination on whether further rockhopper and roller gear restrictions are needed. This alternative would not provide any additional habitat protection above current levels. The current maximum size of rockhopper and roller gear in use may be too big to allow for any habitat protection (i.e., there may be no areas currently inaccessible with current rockhopper and roller gear).

5.3.9.2.2 Alternative 8(b) - A prohibition on the use of otter trawl groundgear with a diameter larger than 22”

This alternative prohibits the use of rockhopper and roller trawl gear with a diameter larger than 22”. Cookies or other types of groundgear configurations, including rockhoppers and rollers, 22” in diameter or smaller would be allowed. The implementation of this alternative could be via an immediate prohibition on all gear larger than 22”, or could be done through a step-wise reduction over several years (see 8(e)). This alternative is very similar to Alternatives 8(c), but uses 22” as the maximum allowable size rather than 12”, which would allow some configurations of rockhopper and roller trawl gear to continue to be fished.

Setting limits on the maximum allowable size for rockhopper and roller gear could protect rough bottom habitats from any adverse impacts associated with these gear types by limiting the areas where mobile bottom gear can access. Long-term this could be more economically efficient for the groundfish fishery. As the maximum allowable diameter of the gear decreases, more and more rough bottom habitat would be protected from impacts associated with mobile bottom gear. This alternative would offer more flexibility to the fishing industry than the 12” or 5” options.

There may be short-term costs to the industry from the loss of gear and having to buy new gear to comply with the measures. There may also be short-term production losses (less fish and less revenue) to the industry, although these losses will be mitigated as stocks recover. The smaller the maximum allowable size for this gear, less area and opportunities will remain for the fishing industry. Also, the remaining areas accessible for fishing may be fished harder as more fishermen move into these areas and this could reduce the availability of suitable habitat in open areas. There may be more competition between fishermen for accessible bottom, with the potential for increases in gear conflicts. This alternative would protect less area than the 12", 8", or 5" options.

5.3.9.2.3 Alternative 8(c) - A prohibition on the use of otter trawl groundgear with a diameter larger than 12", consistent with the existing maximum size limit in near shore portions of the Gulf of Maine.

This alternative prohibits the use of rockhopper and roller trawl gear with a diameter larger than 12". Cookies or other types of groundgear configurations, including rockhoppers and rollers, 12" in diameter or smaller would be allowed. The implementation of this alternative could be via an immediate prohibition on all gear larger than 12", or could be done through a step-wise reduction over several years (see 8(e)). This alternative allows some configurations of small rockhopper and roller trawl gear to continue to be fished.

This alternative would be an extension of a limit already in place in the Inshore Restricted Roller Gear Area.

5.3.9.2.4 Alternative 8(d) - A prohibition on the use of all rockhopper and roller trawl gear.

This alternative prohibits the use of all rockhopper and roller trawl gear with a diameter larger than 5". Cookies 5" in diameter or smaller would be allowed. The implementation of this alternative could be via an immediate prohibition on all gear larger than 5", or could be done through a step-wise reduction over several years (see 8(e)). Five inches was identified as an option for the maximum size of cookies based on gear commonly stocked by gear distributors and used by fishermen in New England. Cookie size is reported to be somewhat variable and may vary from 3" to 5" in diameter. A 4" limit or any other limit less than 5" may be smaller than the current size cookie commonly used and may cause economic impacts to the industry that are out of proportion with the expected benefits of the action.

5.3.9.2.5 Alternative 8(e) - A stepwise reduction in the maximum allowable size of otter trawl groundgear.

This could be considered a stand-alone alternative, or it could be incorporated into any of the reductions/prohibitions on rockhopper and roller gear size considered as alternatives above except for alternative 8.1.

This alternative proposes a prohibition on the use of any otter trawl groundgear as follows: From the start of the fishing year (beginning May 1) that begins after the implementation of Amendment 13 to the Groundfish FMP, the maximum allowable diameter of groundgear will be reduced in stages over a period of six years from a maximum of 24 inches to a maximum of 5 inches. For example, if Amendment 13 to the Groundfish FMP is implemented to begin on May 1, 2003, the maximum size of groundgear will be 24 inches from May 1, 2003 until April 30, 2005; it will then be reduced to 12 inches from May 1, 2005 until April 30, 2007, reduced to 8 inches until April 20, 2009. Thereafter, beginning May 1, 2009, the maximum size of groundgear will be 5 inches. The specific dates are examples of a reduction program that could be used. While the May 1 start dates make sense as the beginning of the new fishing years, the program could be compressed over less time, stretched out over a longer timeframe, or the individual time periods that each size limit is in force could be varied. Also, the specific gear size increments could be different (e.g., from a maximum size of 30" to 24", then to 18", and then to 12").

This alternative would decrease fishable area gradually. This may provide increased flexibility to both the fishing industry and management. By delaying implementation of the most stringent gear size restrictions, this alternative should spread out the short-term compliance costs and provide time for the industry to adjust to changing regulations. Setting limits on the maximum allowable size for rockhopper and roller gear could protect rough bottom habitats from any adverse impacts associated with these gear types by limiting the areas where mobile bottom gear can access. Long-term this could be more economically efficient for the fishery. As the maximum allowable diameter of the gear decreases, more and more rough bottom habitat would be protected from impacts associated with mobile bottom gear.

If reducing the maximum allowable size of rockhopper and roller gear is necessary to conserve fish habitat, this alternative would delay much of the anticipated benefits of the measure. There will be short-term costs to the industry from the loss of gear and having to buy new gear to comply with the measures. There may also be short-term production losses (less fish and less revenue) to the industry, although these losses will be mitigated as stocks recover. The smaller the maximum allowable size for this gear, less area and opportunities will remain for the fishing industry. Also, the remaining areas accessible for fishing may be fished harder as more fishermen move into these areas and this could reduce the availability of suitable habitat in open areas. There may be more competition between fishermen for accessible bottom, with potential for increases in conflicts.

5.3.9.3 Alternative 9 – VMS on all groundfish vessels

This would be a critical step in getting high resolution data on the distribution of fishing effort. While there may be issues and problems that need to be resolved before VMS could reasonably be required on all groundfish vessels, addressing these issues and fixing the problems should be a high priority of Amendment 13. The specifications on how best to implement this alternative will be left to the Groundfish Committee and PDT. Ideally, this alternative would be implemented in a way that is not unnecessarily burdensome to groundfish vessels (e.g., eliminate the 24 hour/day operating requirement).

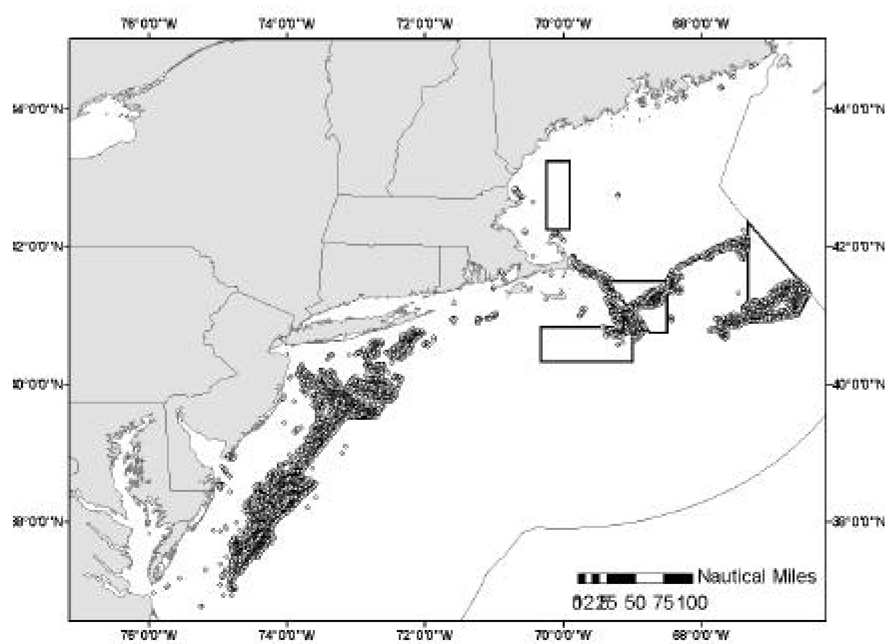


Figure 170 – VMS data from 2000 showing spatial extent of actual scallop fishery

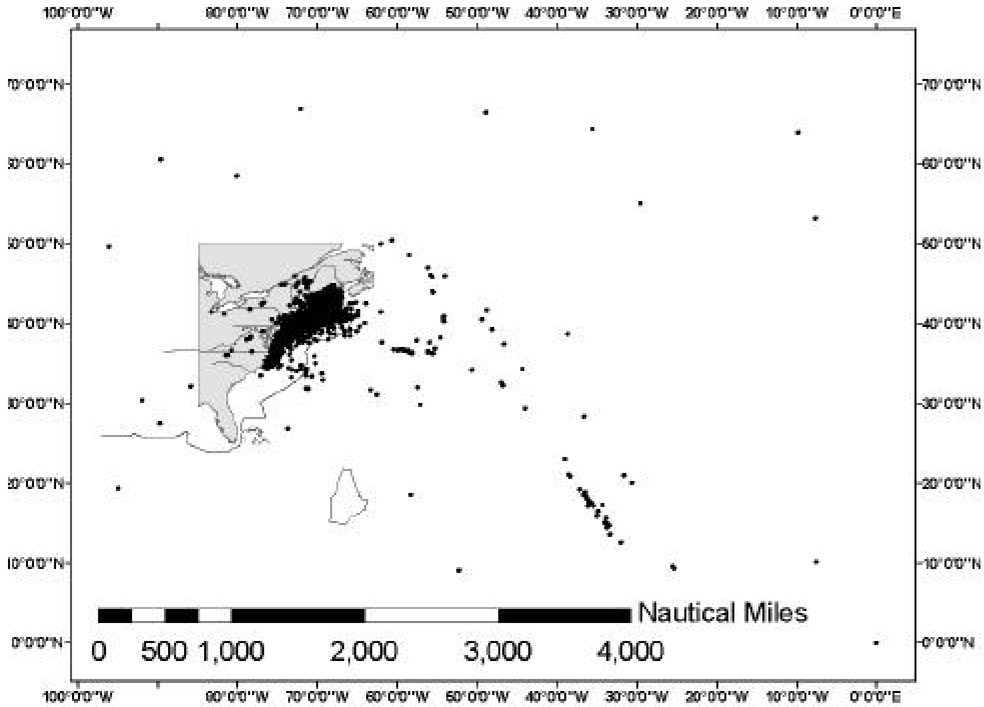


Figure 171 – VTR data (unfiltered) from 2001 showing spatial extent of reported groundfish fishery

The intention of this alternative is not enforcement, but rather much needed and important data collection on the location, frequency and intensity of fishing activities, which has direct application and relevance to understanding potential impacts to habitat. Figure 170 and Figure 171 show the disparity between existing spatial data sets. Implementation of VMS on all groundfish vessels would provide the Council with much needed accurate information on the distribution of fishing effort. Without implementation of the VMS requirement, progress on habitat research and management will be hampered, slowing our ability to answer many habitat-related questions.

5.3.10 Practicability Analysis

The legal EFH provisions state that each FMP shall identify and "minimize to the extent practicable adverse effects on such habitat caused by fishing…" In this context "practicable" was interpreted to man "reasonable and capable of being done in light of available technology and economic considerations."

The EFH regulations at 50 CFR 600.815(a)(2)(iii) provide guidance on evaluating the practicability of management measures:

"In evaluating the practicability of the identified habitat management measures, Council should consider the nature and extent of the adverse effect on EFH and the long and short-term costs and benefits of potential management measures to EFH, associated fisheries and the nation consistent with national standard 7. In determining whether management measures are practicable, Councils are not required to perform a formal cost/benefit analysis."

A practicability analysis of EFH measures in a fisheries management plan is supposed to weigh the economic and social costs (and benefits) against the benefits to habitat of EFH protections. However, the ecological costs and benefits (of taking or not taking action) are substantially harder to evaluate. In essence, the benefits of specific actions to protect or restore habitat are not all readily quantifiable in the same units as the costs (dollars). It is therefore very difficult to make direct quantitative comparisons and hence give specific quantified answers to questions of practicability. This is in part due to uncertainty in the direct effects of fishing gears on habitat function and the lack of information on the relationships between habitat function and the productivity of managed and non-managed species. This uncertainty and lack of information is both a consequence of and exacerbated by the complexities of the ecological relationships and processes involved.

5.3.10.1 Assessing Practicability

There is no preferred methodology for conducting the practicability analysis. Therefore, the Habitat Technical Team and members of the Groundfish PDT have worked together to combine habitat, economic, and social analysis of the habitat alternatives to determine their overall practicability. The habitat closed area alternatives have been analyzed in a more quantitative fashion by incorporating habitat, economic, and social information described in earlier sections of the document. The non-closed area habitat alternatives are analyzed in a more qualitative manner. This analysis synthesizes some of the conclusions from the habitat analysis, the socio-economic impact analysis, the biological and ecological impacts, as well as issues such as compliance with National Standards or MSA in general that are described in other parts of the document.

Specific practicability factors relevant to the EFH Final rule requirements were used to determine if each action is reasonable and capable of being done in light of available technology and economic considerations, and will not impose unreasonable burdens on the fishing industry (Table 168). Four primary components have been extracted from the full analysis to assess the practicability of the habitat management alternatives.

Practicability Factor	Relevance to 50 CFR 600.815(a)(2(iii)	Description
Net economic change to fishery	The long and short-term costs and benefits of potential management measures to associated fisheries and the nation	Industry-level impacts to groundfish, scallop, monkfish and other fisheries
Equity of potential costs among communities	The long and short-term costs and benefits of potential management measures to fishing communities	Short-term impacts on coastal subregions
Differences in EFH Value	The nature and extent of the adverse impact on EFH and the long and short-term costs and benefits of potential management measures to EFH (direct impacts)	Directionality of change in amount and type of area, vulnerable or adversely impacted EFH and complex sediment types
Population effects and ecosystem changes	The long and short-term costs and benefits of potential management measures to EFH (indirect impacts)	Directionality of change in amount and type of important species guilds and species assemblages

Table 168 – Description of four (4) primary analytical components used to determine practicability

5.3.10.2 Assessing Environmental Consequences/Impacts and Practicability with Limited Information

According to information included and evaluated in this document (see Gear Effects Evaluation, Vulnerability of EFH to Bottom-Tending Fishing Gears, and Adverse Impact Determination Sections), there is some understanding in the Northeast U.S. that a relationship exists between the type and intensity of fishing and effects on habitat. For some species, there is also some understanding of the links between exploited populations and habitat in terms of ecological functions. However, there is little or no understanding of how habitat degradation (past, present and future) affects the productivity of managed species populations. According to a provisional framework outlined in Auster (2001), it would seem that the types of management measures needed for preventing, mitigating, or minimizing adverse effects of fishing on EFH are a mixture of preventative and corrective measures and the precautionary approach. The types of actions the author suggests be taken under each of these approaches are as follows:

Preventative approach: restrict effort or gear or use no-take marine protected areas (MPAs) to minimize effects of particular gear types on particular habitats.

Corrective approach: Adjust boundaries or change management measures on the basis of data on habitat recovery and links to population dynamics.

Precautionary approach: Designate no-take MPAs to protect long-lived and sensitive species in areas that do or potentially contain such taxa.

The Council will be considering similar issues and approaches in the upcoming Omnibus Habitat Amendment #2. Additionally, the Council's MPA Committee will be developing a policy and approach to MPAs for the Council's consideration in the near future.

5.3.10.3 Results

5.3.10.3.1 Net economic change to fishery

5.3.10.3.1.1 Potential revenue losses to groundfish, scallop, monkfish and other fisheries

Table 169 compares the short-term annual revenue impacts from lost landings (assuming no displacement of effort to other areas) to all fisheries of each habitat closed area alternative implemented as either a Level 1 closure (total prohibition on all gears) or a Level 3 closure (prohibition on mobile, bottom-tending gear only). Table 170 summarizes the same information by fishery on a percentage basis. Total economic impacts, including lost employment and collateral income losses in the processing sector and in other associated industries and activities (again assuming no displacement of effort), are summarized in Table 171.

Revenue losses would be highest as a result of implementing habitat closed area 5b, nearly reaching $40 million, while either Alternative 6, 10(a) or 10(b) would reduce these impacts by nearly ten-fold. The remaining six alternatives would have impacts ranging from $15 to $25 million. Closing an area to just mobile, bottom-tending gear would reduce total revenue losses by 21-23% for Alternatives 3a, 3b, and 4. For the Alternative 5 variants the revenue losses are reduced by as much as 46% (Alternative 5c). Much of this reduction in revenue impact is associated with savings of monkfish gillnet and lobster trap fishery revenues. A Level 3 habitat closure would have the largest mitigating effect on Alternatives 6, 10A, and 10B.

Alternative	Level 1	Level 3	Reduced Impact ($)	Reduction in Loss (%)
3a	23,237,630	18,098,883	5,138,747	22%
3b	22,042,497	17,498,370	4,544,127	21%
4	15,599,271	11,970,233	3,629,039	23%
5a	20,251,311	11,730,565	8,520,746	42%
5b	38,394,041	24,470,730	13,923,311	36%
5c	25,289,695	13,780,403	11,509,291	46%
5d	16,738,994	9,208,996	7,529,998	45%
6	3,990,045	1,436,544	2,553,501	64%
10A	4,162,998	1,345,937	2,817,060	67%
10B	3,768,834	1,570,002	2,198,832	58%

Table 169-Summary of Revenue Impacts by Alternative and Habitat Closure Level

5.3.10.3.1.2 Potential Revenue loss for groundfish based on fishing year 2001

A "no-displacement" assessment was completed to get a measure of the groundfish landings that were generated from within the closed area alternatives compared to the entire area. The Vessel Trip Report (VTR) database was used to identify trips taken place in fishing year 2001 that reported landings within the geographical area. Reports that did not include a location, or were misreported were excluded from this analysis. Revenues associated with any area inside a proposed closed area were assumed to be lost

(See section Economic Impacts Analysis for EFH Alternatives for a complete description of the methods used in this analysis). Thus, the revenue losses generated from the no-displacement methods are upper bound or worst case estimates. Fishing year 2001 was selected because that is the most current data available (FY 2002 data was not available in time for this analysis).

In general, closing the areas within Alternative 5b would cause the greatest potential loss in revenues, followed by Alternatives 5c, 3a, and 3b (Table 170). Because they include so much of the existing groundfish closed areas, Alternatives 6, 10a and 10b would produce the lowest losses in groundfish revenues.

5.3.10.3.1.3 Potential revenue loss for other fisheries based on fishing year 2001

The same "no-displacement" analysis method described above was also completed for other fisheries in the region. The potential impacts on the surf clam/ocean quahog fishery were evaluated separately because landings in the clam VTR are reported in bushels rather than pounds, so an average price from dealer records was assigned and applied to the bushel amounts.

Scallop Fishery
The losses in revenues for the scallop fishery are the same if the habitat closed areas are implemented as Level 1 or Level 3 closures. Closing the areas within Alternative 5b would cause the greatest potential loss in revenues (assuming no displacement of effort to areas outside the closed areas), followed by Alternatives 3a and 3b. Closing areas identified in Alternatives 5a, 5c, 5d, 6, 10a, and 10b would have very little effect on scallop revenues.

Monkfish Fishery
The monkfish fishery could potentially face a loss of revenues between 2% and 18% under any of the habitat closed areas being considered as Level 1 closures. The potential revenue losses are lower if the habitat closed areas are implemented as Level 3 closures. According to this analysis, alternative 5(a-d) would impact the monkfish fishery more than the other alternatives, assuming no displacement of effort.

Other fisheries
The fisheries included in the "other" category of this analysis include: dogfish, skates, lobster, shrimp, herring, mackerel, tunas, and clams. For the practicability analysis, the relative loss in revenues for squid, whiting, fluke, scup, and black sea bass have also been added to this overall calculation. (Refer to the Economic Impacts of EFH Alternatives Section for a more complete discussion of the impacts on each of these fisheries). The potential loss of revenues for all these fisheries combined is significant. Similar to the results for monkfish, Alternative 5(a-d) effect more revenues, assuming no displacement of effort. These impacts are considerably reduced if the closures are implemented as Level 3 closures.

Alt.	Potential Revenue loss for Groundfish Species		Potential Revenue loss for Other fisheries					
	Percent of revenue contained inside a closed area versus total (based on 2001 VTR data assuming "no displacement")		Scallop		Monkfish		Other fisheries	
	Level 1	Level 3	Lev.1	Lev.3	Lev.1	Lev.3	Lev.1	Lev.3
3(a)	-17.4%	-14.1%	-6.5%	-6.5%	-6.0%	-2.9%	-5.9%	-2.0%
3(b)	-16.1%	-13.3%	-6.5%	-6.5%	-5.1%	-2.7%	-5.6%	-2.0%
4	-13.4%	-11.3%	-3.3%	-3.3%	-3.5%	-2.2%	-4.3%	-1.0%
5(a)	-13.7%	-10.6%	-1.4%	-1.4%	-18.3%	-6.3%	-13.9%	-8.3%
5(b)	-21.6%	-14.0%	-10.8%	-10.8%	-18.2%	-6.3%	-16.7%	-6.6%
5(c)	-16.3%	-13.3%	-1.5%	-1.5%	-16.4%	-6.4%	-20.7%	-8.9%
5(d)	-13.4%	-9.3%	-1.0%	-1.0%	-11.1%	-3.4%	-11.8%	-7.0%
6	-1.7%	-1.3%	-0.3%	-0.3%	-1.8%	-0.6%	-3.8%	-0.5%
10(a)	-1.6%	-1.1%	-0.4%	-0.4%	-3.6%	-0.5%	-2.9%	-0.1%
10(b)*	-1.8%	-1.2%	-0.4%	-0.4%	-3.6%	-3.6%	-1.9%	-0.2%

Table 170 – Summary of benefits and economic costs associated with closure alternatives.
**Proposed measure*

There are three types of economic and social costs that could result from the ten closed area habitat alternatives being considered in Amendment 13. First, if the existing groundfish closed areas, or portions of these areas, remain off limits to gears capable of catching groundfish, then habitat closures inside these areas provide no additional EFH protections in the foreseeable future and no economic or social costs. This situation applies to the No Action alternative (Habitat Alternative 1) and Habitat Alternative 6. Alternative 2, which claims incidental habitat benefits from new measures proposed in Amendment 13, would not result in any EFH-related economic or social costs either.

Second, if groundfish stocks recover to the point that some of the existing closed areas could be opened to the groundfish fleet, but access is denied in portions of the groundfish closures that have been designated as habitat closures, there will be significant negative impacts on affected fisheries and communities, unless the habitat closures increase the productivity of fishery resources in open areas. This situation could pertain to alternatives 3, 4, 6, and 10. Finally, habitat closures that extend beyond current groundfish closed area boundaries will potentially result in negative economic and social impacts whether the groundfish areas are opened to other fisheries or not. This situation would apply primarily to Alternative 5 and less so to alternatives 3, 4, and 10.

Alternative	3a	3b	4	5a	5b	5c	5d	6	10a	10b*
Sales Impacts	102.5	97	68.2	71	150.3	99.3	66.4	15.6	13.7	12.4
Income Impacts	29.8	28.2	20	20.8	43.1	29.6	19.3	4.4	5.4	4.9
Total Economic Losses	132.3	125.2	88.2	91.8	193.4	128.9	85.7	20	19.1	17.3
Employment Losses	1457	1391	982	939	2134	1298	857	211	194	175

Table 171 - Impacts of habitat closed area alternatives on gross sales (millions of dollars), income (millions of dollars), and employment (jobs) in the New England coastal region
** Proposed measure*

The impacts on gross sales, income and employment in the New England coastal region would be greatest for Alternative 5b while either Alternative 6, 10A or 10B would reduce these impacts by nearly ten-fold. The impacts are likely to be upper-bound estimates since the potential impacts of Level 3 versus Level 1 were not estimated. In between these extremes, the remaining alternatives form two clusters, each having similar impacts. Specifically, Alternatives 3a, 3b and 5c form one of these clusters with gross sales impacts of about $100 million, income losses of about $30 million, and employment losses of up to 1,400 jobs. Alternatives 4, 5a, and 5d form a second cluster with lower impacts of about $70 million in sales, $20 million in income losses, and losses of less than 1,000 jobs.

5.3.10.3.2 Equity of potential costs among communities

5.3.10.3.2.1 Short-term impacts on coastal subregions

There are numerous ways to describe the potential social impacts of closed areas on ports and fishing communities. This practicability analysis focuses on the relative distribution of gross sales impacts by sub-region in New England to give an indication of how they would be distributed in different parts of the region. Alternatives which have a disproportionate impact on just a few sub-regions are less practicable than alternatives with impacts that are dispersed across a number of sub-regions (Table 172). Impacts to gross sales measure the total losses associated with a reduction in harvest on all industries impacted by fishing in the region (processing, transportation, etc.). The general patterns of total economic impacts from each proposed alternative are described for each of ten sub-regions (Table 172). (Refer to the Economic Impact and Social Impact Assessment Sections for a more detailed analysis of the losses by port and vessel characteristic classes and expected changes to income and employment).

Most of the gross sales impacts that would result from the proposed habitat closed area alternatives are concentrated in the four Massachusetts sub-regions (Table 172). Sub-regions in Maine, New Hampshire, Rhode Island, and Connecticut would be not be greatly affected. The New Bedford area (all ports within Bristol County, MA but principally the city of New Bedford itself) would be the most impacted, bearing about two-thirds of the gross sales impacts under Alternatives 3a, 3b, and 4, 23-42% under Alternatives 5a, 5c, and 6, and 15-18% under 5d, 10a and 10b. This level of impact is largely due to the importance of New Bedford groundfish, monkfish, and scallop fisheries - fisheries that would be most affected by habitat closures. Note that with the exception of monkfish, both scallops and groundfish would be affected even by a Level 3 closure (Table 170) so that while the magnitude of the impact would be reduced by a Level 3 closure, the proportional impact on the New Bedford sub-region would not be likely to change and may be even greater than the impact in other sub-regions. Other than New Bedford, impacts in the Gloucester area would also be severe (43-45%) for Alternatives 5c and 5d, moderate (27%) for 5a and 5b, and less severe (14-19%) for Alternatives 3a, 6, 10a and 10b. The Boston and Cape and Islands sub-regions would be less severely impacted (<20% for all alternatives).

Sub-Region	Alt 3a	Alt 3b	Alt 4	Alt 5a	Alt 5b	Alt 5c	Alt 5d	Alt 6	Alt 10a	Alt 10b*
Upper Mid-Coast Maine	0.4%	0.4%	0.4%	2.3%	0.6%	1.7%	2.5%	1.8%	2.2%	2.3%
Lower Mid-Coast Maine	2.0%	2.1%	3.1%	2.6%	0.7%	1.6%	1.8%	10.9%	5.5%	6.6%
Southern Maine	0.0%	0.0%	0.1%	1.2%	0.5%	0.1%	0.4%	0.3%	0.6%	0.7%
New Hampshire Seacoast	1.3%	1.3%	1.5%	4.8%	2.6%	0.6%	4.3%	9.6%	11.8%	8.3%
Gloucester Area	14.1%	9.4%	6.5%	27.5%	26.8%	42.9%	45.0%	19.3%	13.7%	14.4%
Boston Area	2.7%	2.8%	3.8%	12.3%	4.2%	14.3%	9.3%	2.9%	17.1%	17.4%
Cape & Islands	10.5%	11.0%	14.6%	13.9%	17.7%	10.5%	13.4%	19.0%	8.3%	8.2%
New Bedford Area	67.7%	71.5%	68.2%	29.3%	42.2%	22.6%	14.8%	32.5%	17.2%	18.3%
Rhode Island	0.8%	0.9%	1.1%	5.6%	3.6%	4.1%	7.3%	3.2%	4.6%	4.7%
Connecticut Seacoast	0.5%	0.5%	0.7%	0.4%	1.1%	1.7%	1.2%	0.4%	8.4%	8.5%

Table 172- Relative Distribution of Gross Sales Impacts by Sub-Region in New England
**Proposed measure*

5.3.10.3.3 Differences in Habitat Value Between Closure Alternatives

Three primary components have been incorporated in the overall habitat evaluation portion of the practicability analysis: 1) size and percent overlap with groundfish closed areas, 2) EFH value, and 3) amount of rocky substrate. The size/overlap component includes the area of each alternative in square nautical miles, and the percent of each alternative that occurs inside the existing groundfish closed areas. The EFH component includes the percent of total moderately (M) and highly (H) vulnerable adult and juvenile EFH area contained within each proposed closure for the twelve groundfish species managed under the Multispecies FMP, and the percent of total M/H vulnerable adult and juvenile EFH area for all species within the closures. It also includes per-unit-area EFH values for all species with M/H vulnerable and with only H vulnerable EFH. The substrate component of the practicability analysis includes the amount of bedrock and "gravel" (in square nautical miles) contained in each area. These two substrate types best represent "hard-bottom" habitats, which are structurally more complex and support the growth of emergent epifauna. The "gravel" substrate classification includes pebbles, cobbles, and boulders.

The area closure options range from about 2,200 to 4,000 square nautical miles in size (Table 173). The ten alternatives under consideration range from no overlap to 100% overlap with the existing groundfish closures. Alternatives 3a, 3b, and 4 overlap 53-69% and alternatives 10a, and 10b overlap 81-82%. Alternative 6 is the largest proposed closed area and overlaps entirely with the existing closures. The habitat closed area alternatives contain 5.6-8.5%of the total amount of vulnerable EFH area for groundfish in the NWAA. Percent-of-total EFH values for all species with M/H vulnerable EFH range from 5.1% to 7.8%. Alternative 6 contains the highest amount of total EFH for both categories. The substrate component, however, demonstrates a large disparity among the alternatives, with 3(a), 3(b), 4 and 6 containing more rocky substrate than the others, followed by alternatives 10a and 10b.

Table 174 summarizes the effectiveness of the various closure options based upon the amount (summed area) of designated EFH they contain relative to their size. Alternative 5(c) contains the most EFH for species and life stages with medium and highly vulnerable EFH per square nautical mile of closed area. Alternatives 3a-b, 4, 5a-b, and 10b would provide roughly equivalent EFH protection on a per-unit-area basis. Alternatives 5(d), 6 and 10a ranked the lowest on a per square nautical mile basis.

Alt.	Size and Overlap with Groundfish Closures		Vulnerable Groundfish EFH	Vulnerable EFH for All Species	Rocky Substrate
	Area closed in square nautical miles	Percent of closure that overlaps with current groundfish closed areas	Percent of total EFH contained in each area for all Groundfish species with "highly or moderately vulnerable" EFH	Percent of total EFH contained in each area for all species with "highly and moderately vulnerable" EFH	Total amount of Bedrock and "Gravel" enclosed by each alternative (measured in square nm)
3(a)	2913	53%	7.0%	6.1%	196
3(b)	2821	55%	6.7%	5.9%	196
4	2241	69%	5.6%	5.0%	154
5(a)	3032	5%	7.0%	6.3%	21
5(b)	3073	5%	7.0%	6.6%	15
5(c)	3022	0%	7.2%	6.6%	32
5(d)	3098	6%	5.8%	5.4%	38
6	4041	100%	8.5%	7.8%	92
10(a)	3050	82%	7.5%	6.5%	109
10(b)	2810	81%	7.0%	6.2%	109

Table 173 - Summary of benefits and costs associated with the EFH protection of each closure alternative.

Alternatives	Medium/Highly Vulnerable Species	Highly Vulnerable Species Only
	Sum*	Sum*
3a	17.35	5.50
3b	17.25	5.41
4	18.40	5.75
5a	17.26	5.53
5b	17.64	5.26
5c	18.14	5.65
5d	14.39	4.57
6	16.01	4.67
10a	17.70	5.95
10b**	18.14	6.04

Table 174 - Relative Effectiveness of Amendment 13 Habitat Closed Area Alternatives in Protecting EFH for Two Categories of Species and Life Stages

**Values are total EFH area (in square nautical miles) per square nautical mile in each closed area summed for all moderately and highly vulnerable species and life stages in the Northeast region, and for only the highly vulnerable species and life stages in the region.*

***Proposed measures*

5.3.10.3.4 Population effects and ecosystem values

Distribution of biomass by type of trophic guild and species assemblage

The EFH Final Rule stipulates that fishery management measures be evaluated in terms of their direct and indirect effects on essential fish habitat, or the direct and indirect benefits of proposed habitat protection measures in meeting the provision of the Magnuson-Stevens Act to minimize the effects of fishing on EFH. The previous section of this Practicability Analysis considered the more direct benefits of the ten proposed habitat closure alternatives on EFH. This section evaluates the indirect benefits or ecosystem effects of these closures on EFH by examining the fish communities that occupy them (Table 175).

Alt.	Trophic Guilds*			Species Assemblages *	
	Bottom Feeders	Amphipod Feeders	Shrimp and Fish Feeders	Principal Groundfish	Demersal Finfish
3(a)	42%	11%	24%	22%	49%
3(b)	42%	11%	23%	21%	49%
4	43%	11%	23%	22%	49%
5(a)	26%	14%	17%	11%	47%
5(b)	33%	14%	6%	9%	47%
5(c)	32%	15%	9%	11%	47%
5(d)	28%	8%	12%	11%	45%
6	36%	14%	26%	15%	49%
10(a)	43%	8%	29%	17%	49%
10(b)**	43%	8%	31%	17%	49%

Table 175 - Percent composition of total biomass (summed mean wt/tow by ten minute squares of latitude and longitude) within each proposed habitat closed area for three trophic guilds and two species assemblages during 1995-2001
(Two guilds and three assemblages not shown).*
*** Proposed measure*

Bottom-feeding fish accounted for most of the total biomass in all the proposed closed areas and would therefore benefit the most from management measures that minimize the adverse impacts of fishing on EFH. This result confirms the importance of habitat closures that protect benthic invertebrate prey populations, which are the food source for benthic-feeding fishes. Fish that feed exclusively on other fish and on plankton were more abundant in the four Alternative 5 options. Species and sizes of fish that feed on shrimp and smaller fish are also important components of the fish fauna in alternatives 3a, 3b, 4, 6, 10a and 10b.

Principal groundfish species (cod, haddock, redfish, pollock, two species of hake, and five species of flounder) accounted for a greater proportion of the finfish biomass in alternatives 3a, 3b, and 4, but were also important components of the fauna in proposed closures 6, 10a, and 10b. These species made up a relatively small percentage of the fish biomass in the Alternative 5 options. A large group (many species) of demersal (bottom-dwelling) finfish species accounted for about 50% of the fish biomass in all the alternatives.

These results indicate that habitat closed areas would be practicable as management measures to protect assemblages of bottom-feeding and bottom-dwelling finfish, especially alternatives 3a, 3b, 4, 6, 10a, and 10b. Fish populations in the four Alternative 5 closures were ecologically more diverse and included pelagic as well as demersal species.

5.3.10.3.4.1 Alternative 1 (No Action)

Net economic change to fishery – Since this alternative would simply maintain the existing groundfish closed areas, there are no new costs associated with it. It also would not impose any additional regulations on the industry since the same measures would be in place as in fishing year 2001.

Equity of potential costs among communities - It is not expected that the industry or fishing dependent communities would be impacted in any additional way from the status quo habitat alternative.

Differences in EFH Value - While this alternative does not close areas solely for habitat protection, it does provide some measure of protection to EFH in the region. This protection is reduced by the impacts of bottom tending mobile gears that are exempted from the groundfish closures (see Alternative 7) and by the fact that these closures will last, in their present configurations, only as long as they are needed to help restore depleted groundfish stocks. This alternative may be practicable in the short term because it will maintain habitat benefits that have accrued inside the closed areas since they were first established, at no cost to the industry, but it will not protect habitats as effectively as other measures that are designed specifically for that purpose and which will remain in place for indefinite periods of time. Continued habitat modification consistent with ongoing trends may occur if this alternative is selected.

Population effects and ecosystem changes – The analysis of fish community composition in the existing groundfish closed areas was not carried forward into the Practicability Analysis because the groundfish closed area do not constitute habitat closed areas and thus would provide no long term protection for fish that reside in these areas.

5.3.10.3.4.2 Alternative 2 (Proposed measure)

Alternative 2 aims to minimize the adverse effects of fishing on EFH through the use of the resource management measures in Amendment 13. Amendment 13 includes a number of proposed management measures that will severely reduce habitat impacts (both long- and short- term) through reductions in fishing effort (days-at-sea), gear modifications, trip/catch limits, time/area restrictions, and capacity reduction alternatives, among other things. The resource management alternatives that provide significant habitat benefits in Amendment 13 may minimize the adverse effects of fishing to the extent practicable even though their economic and social costs are high. Since there are no additional social or economic impacts associated with the use of this alternative as a habitat protection alternative, it is a practicable habitat management alternative.

5.3.10.3.4.3 Alternative 3

Net economic change to fishery - The two options being considered under this alternative would close approximately 1100-1200 square nautical miles of open access ocean bottom on Georges Bank and in the Gulf of Maine to fishing by certain gear types. The potential groundfish revenue loss (assuming no displacement of effort that occurred inside the areas during 2001) that would result from either of these alternatives is high (16-17% Level 1 and 13-14% Level 3). The potential loss in scallop revenues (6.5%) is not as high as in Alternative 5b, but is higher than any of the other alternatives. The potential loss in monkfish revenue is moderate (5-6% Level 1 and 3% Level 3), but much lower than in the Alternative 5 closures. The distribution of impacts in other fisheries is about the same as for monkfish.

Equity of potential costs among communities - These two closure alternatives would heavily impact the New Bedford area, with minor effects on the Gloucester and Cape and Islands sub-regions. No other sub-regions within New England would be significantly impacted.

Differences in EFH Value – Both options under this alternative are about the same size as most of the other proposed habitat closures and overlap nearly 60% with the existing groundfish closures. They would close approximately 1100-1200 square nautical miles of open access ocean bottom on Georges Bank and in the Gulf of Maine to mobile, bottom-tending gear. The amount of rocky substrate in Alternatives 3a and 3b is higher than in any of the other proposed habitat closures except Alternative 4. Percent-of-total EFH values for groundfish species and for all species with EFH that is moderately (M) or highly (H) vulnerable to the adverse effects of fishing in Alternatives 3a and 3b are intermediate between the high values in Alternative 6 and the low values in Alternatives 4 and 5d. On a per-unit-area basis, EFH values for species with M and H vulnerable EFH, and with H vulnerable EFH, are also intermediate. Overall, both alternatives 3a and 3b are beneficial from a habitat standpoint because they add significantly more sensitive habitat protection from relatively small closures. The ability of these closed areas to minimize the adverse impacts of fishing on EFH is high.

Population effects and ecosystem changes – The proportions of bottom feeding fish and principal groundfish species are high in these two alternatives, indicating that they would offer a high degree of protection to these elements of the ecosystem. The proportions of amphipod and shrimp/fish-eaters guilds are moderate. Demersal finfish species account for almost half of the species included in the analysis, as they do in all the other alternatives.

Summary - Overall, owing to their high economic costs and disproportionate community impacts, these two alternatives are not practicable, despite the fact that they would do a relatively good job of protecting EFH, bottom-feeding fish, and principal groundfish species, and contain more high value rocky substrate than most of the other alternatives.

5.3.10.3.4.4 Alternative 4

Net economic change to fishery – The potential revenue losses associated with this habitat closure are slightly less than Alternatives 3a and 3b for all four fishery categories.

Equity of potential costs among communities – This alternative would heavily impact the New Bedford area, with minor effects on the Cape and Islands sub-region. No other sub-regions within New England would be significantly impacted.

Differences in EFH Value – This proposed habitat closed area is smaller than all of the other closure alternatives, but it does overlap fairly significantly (69%) with the existing groundfish closed areas and would therefore only close 700 square nautical miles of open access area to mobile, bottom-tending gear. Because there is a high degree of overlap between alternatives 3a/b and 4, the sediment compositions of the three alternatives are very similar. The amount of rocky substrate in Alternative 4 is high, but not quite as high as in Alternatives 3a and b. Because it is so small, Alternative 4 contains a lower percentage of total EFH area for the 23 species with moderately (M) and highly (H) vulnerable EFH, and for 12 groundfish species with M/H vulnerable EFH, than any other proposed habitat closure. On a per-unit-area basis, however, the total EFH value for all species with M/H vulnerable EFH is higher than in any of the other alternatives. For species with H vulnerable EFH, the area scaled EFH value is moderate. This proposed closure has a high overall EFH value because it would more effectively protect high priority, rocky habitat and vulnerable EFH than larger closures.

Population effects and ecosystem changes – The proportions of bottom feeding fish and principal groundfish species are high in this alternative, indicating that it would offer a high degree of protection to these elements of the ecosystem. The proportions of amphipod and shrimp/fish eaters guilds are moderate.

Summary - The economic costs of closing the areas included in this alternative would be fairly high and, like Alternative 3, it would heavily affect New Bedford. It is a small area, however, has a high per-unit-area EFH value, would protect bottom-feeding fish and principal groundfish species, and contains more high value rocky substrate than most of the other alternatives. It also would close less open access fishing area than Alternative 3. However, due to the disproportionate social and economic cost to one sub-region and the overall high economic cost, it is not a practicable habitat management alternative.

5.3.10.3.4.5 Alternative 5

Net economic change to fishery – The four Alternative closure options would generate significant losses in groundfish revenue, especially if implemented as a Level 1 closure in area 5b. Losses in scallop revenue would be high in Alternative 5b as well, but not in the other Alternative 5 closure options. Losses in monkfish and other fishery revenue would also be high. From a regulatory standpoint, these alternatives are less practicable because they include closed areas in the Mid-Atlantic region, which may not be necessary to protect New England species. Additionally, the Mid-Atlantic Council has determined that it is not necessary to implement year-round closures to protect species managed by the Mid-Atlantic Council. Qualitatively speaking, the costs associated (economic and political) with implementing these closures may outweigh the habitat benefits associated with closing them.

Equity of potential costs among communities – Economic impacts resulting from these four closure alternatives would be more evenly distributed among the four Massachusetts sub-regions than the impacts of alternatives 3 and 4. Alternative 5a would affect Gloucester and New Bedford to the same degree, 5b would primarily affect New Bedford and secondarily affect Gloucester, 5c would affect Gloucester more heavily than New Bedford, and 5d would primarily affect only Gloucester. Boston and the Cape and Islands sub-regions would be affected to a lesser degree (<20%) by all the alternatives.

Differences in EFH Value – All four options under this alternative are intermediate in size and either do not extend into the groundfish closures at all (5c), or only marginally (5a,b and d). For that reason, almost all the area that would be closed for habitat protection purposes is located in open access areas. The amount of rocky bottom in all the Alternative 5 options is very low. Percent-of-total EFH area for groundfish species and all federally-managed species in the Northeast region with M and H vulnerable EFH is low in 5d and intermediate in the other three options. Area scaled EFH values for species with M/H vulnerable EFH are high in 5c, low in 5d, and intermediate in 5a and b. Area scaled EFH values for species with H vulnerable EFH are low in 5d and intermediate in the other three options. Overall, of the four options, Alternative 5d would clearly provide the least amount of EFH protection and 5c the most. As a group, however, none of these alternatives would protect as much rocky substrate or vulnerable EFH as the others. They would also require closing a larger extent of open access fishing area than any of the other alternatives.

Population effects and ecosystem changes – Percent composition biomass indices show that the four closed area options in this alternative are low to moderate for benthivores and shrimp/fish eaters. Alternatives 5a-c include a high proportion of amphipod feeders and 5d a low proportion. Principal groundfish species make up a low percentage of the total species biomass in all four Alternative 5 closed area options.

Summary – None of these closed area alternatives are practicable. They would close over 2,500 square nautical miles of open access fishing area with very little rocky bottom. Economic impacts would be high and each closure option includes a closed area in the Mid-Atlantic, where New England groundfish species do not reside. EFH values are high in one of the proposed closures (5c), but not in the others, and bottom-feeding fish and principal groundfish species are not important components of the fish communities.

5.3.10.3.4.6 Alternative 6

Net economic change to fishery – Habitat Alternative 6 includes the portions of the existing groundfish closed areas that remained closed during the Scallop Framework 13 Controlled Area Access Program. By allowing mobile, bottom-tending gear to operate in the FW13 scallop access areas, but not in the remaining 80% of the existing groundfish closed areas, the Council will be able to integrate scallop and groundfish habitat management measures more effectively. However, these areas were not originally closed to protect habitat, and were not identified as areas with high habitat value, therefore this alternative may not minimize the habitat effects of fishing as effectively as other habitat closure alternatives that are designed specifically for that purpose. This is the only alternative that does not have significant revenue losses for the groundfish, monkfish, scallop, or "other fishery" categories. This is intuitive since most of this area was not accessible to these fisheries in 2001.

Equity of potential costs among communities – This alternative would affect New Bedford more than any other sub-region, but impacts would also be felt in Gloucester, the Cape and the Islands, and less so in New Hampshire and lower mid-coast Maine.

Differences in EFH Value – This is the largest of all the proposed habitat closed areas and coincides completely with portions of the existing groundfish closed areas that have been closed to groundfish and scallop gear for the past 5-9 years. No new habitat protection would be provided in open access areas. Despite its large size, this alternative does not contain very much rocky substrate. Because of its large size, Alternative 6 includes more total and percent total EFH area than the other nine alternatives for groundfish species and for all species with EFH that is M or H vulnerable to the adverse effects of mobile, bottom-tending fishing gear. On a per-unit-area basis, however, EFH values for species with EFH that is M or H vulnerable, or just H vulnerable to fishing, is low. This alternative would do more to extend the habitat benefits that have resulted from the groundfish closures and to protect vulnerable EFH than any other alternative without closing any new areas, but does not contain very much high value, rocky habitat and would not protect EFH as effectively as some of the smaller proposed closed areas that have higher per-unit-area EFH values.

Population effects and ecosystem changes – In terms of biomass, the fish community in Alternative 6 is composed of a lower proportion of benthivores than alternatives 3a/b, 4, and 10a/b, but a higher proportion than any of the Alternative 5 options. The proportion of shrimp/fish eaters is lower than in Alternatives 10a and 10b and higher than the other alternatives. The composition of amphipod feeders is high relative to the other alternatives. Principal groundfish species make up a smaller percentage of the fish community in Alternative 6 than they do in alternatives 3 and 4, more than in any of the Alternative 5 options, and about the same as in alternatives 10a and 10b.

Summary – This alternative is entirely included within the existing groundfish closed areas, thus it would not have any significant short-term economic impacts on the fishing industry. Community impacts are dispersed among several different sub-regions. It does not include as much rocky substrate as Alternatives 3 and 4, but because it so large, total vulnerable EFH area is higher than any of the other alternatives (but low on a per-unit-area basis). The composition of bottom-feeding fish and principal groundfish species is moderate. It is a practicable alternative, particularly considering that it will not close any new area, has little or no economic impact, and will allow for access to areas within the groundfish closures where scallops are abundant. However, the Council determined that Habitat Alternative 10, Option b better minimized the adverse effects of fishing on EFH.

5.3.10.3.4.7 Alternative 7 (Proposed measure)

Habitat Alternative 7 would expand the list of gears prohibited from use in the groundfish closed areas to include clam dredges. While little revenue data is available to analyze specific economic impacts for this alternative, the proportional loss of surf clam/ocean quahog landings by state is described in Table 299 (refer to results for Alternative 6). Based on data from 2001, 6.8% of total landings came from areas within the groundfish closed areas (exclusively in the Nantucket Lightship closed area). Furthermore, the results suggest that vessels from Massachusetts are the only vessels that would be impacted from this measure. The habitat benefits of this alternative are difficult to measure. Table 167 describes the EFH areas that could potentially benefit as a result of this measure, but in reality, this measure will only impact a portion of the Nantucket Lightship closed area where clam dredges are currently used. This measure will not have habitat benefits for the other groundfish closed areas since clam dredges are not used in Closed Area I, II or the Western Gulf of Maine. It is important to note that other gear types are still permitted in these areas which could reduce the overall habitat benefits of prohibiting clam dredges. Mobile, bottom-tending gears (clam dredges and shrimp trawls) can be expected to adversely impact benthic habitats, whereas fixed gear (pots and traps) and pelagic gear (mid-water trawls) have little or no effect on vulnerable benthic habitats. The practicability of prohibiting clam gear from these areas is relatively high because clam/quahog activity only occurs in a relatively small portion of the overall groundfish closed areas. However, 6.8% of the total revenues from 2001 came from within the closed areas, and all of that revenue is from vessels homeported in Massachusetts. This alternative is still considered practicable because it is likely that trips taken within the closures will be able to harvest the same amount of clams in areas outside the closures, however the efficiency of those trips is unknown as compared to the trips inside the closed areas.

5.3.10.3.4.8 Alternative 8

Habitat Alternative 8 includes a series of options that prohibit the use of different sizes of rockhopper and/or roller trawl gear on bottom trawls in New England. Although rockhopper and roller trawl gear function differently and may interact differently with different types of benthic habitats, there is very little information with which to distinguish the habitat effects of these gears, or to evaluate the habitat benefits that would result from limiting the use of different sizes of roller or rockhopper gear. Conclusions from the evaluation of the different options for this alternative vary from “no effects on fishing pressure and no additional habitat protection” to “direct, short-term costs to the industry and more protection for rough and complex bottoms.” This range of conclusions is obviously the result of a series of tradeoffs between the cost to the industry in gear modifications, potential loss of production, and potential habitat benefits. It may be concluded rather generally that the benefits to EFH may outweigh the costs to industry, making this alternative practicable. Furthermore, direct habitat benefits have not been demonstrated. The Council encourages further research into such gear modifications.

5.3.10.3.4.9 Alternative 9

Habitat Alternative 9 proposes the requirement for VMS on all vessels fishing for groundfish with a federal permit. More accurate information on where fishing effort is taking place would be a very beneficial tool for improving our understanding of species distribution and potential impacts on habitat. This alternative may not be practicable in the short term because of the high investment costs, but in the long term it may be a very useful tool for linking fishing effort and potential impacts on habitat.

5.3.10.3.4.10 Alternative 10 (Proposed measure)

Net economic change to fishery – Because 80% of the area included in Alternatives 10a and 10b is included as part of the existing groundfish closed areas (which were closed to groundfish and scallop fishing in 2001), closing them will result in minimal losses to the groundfish, scallop, monkfish, and other fisheries as compared to all the other alternatives under consideration (except Alternative 6). Closure of 10a to all gear (Level 1) will have a greater economic impact than closing it only to mobile, bottom-tending gear (Level 3). The same is true for other fisheries in both alternatives, but not as clearly. These two alternatives would leave various primary fishing grounds open to the industry, as compared to some of the other closure options that close areas in the Great South Channel and on Georges Bank.

Equity of potential costs among communities – Impacts of these two closures would be well distributed across New England. They would primarily affect New Bedford, Boston, and Gloucester with more or less equal impacts (14-18%) in each sub-region. New Hampshire would be less impacted (12%) and there would be minor (<10%) impacts in several other sub-regions.

Differences in EFH Value - Alternatives 10a and 10b are about the same size as most of the other closed area options, larger than Alternative 4 and smaller than Alternative 6. Most of the proposed closure areas (about 80%) fall within the existing groundfish closures, except for the modification to the Nantucket Lightship closed area, as well as the addition of the closures on Cashes Le dge and Jeffreys Bank in the Gulf of Maine. Alternatives 10a and 10b contain roughly the same amount of rocky substrate as Alternative 6, less than Alternatives 3 and 4, and more than any of the Alternative 5 options. EFH values, unsealed for differences in closed area size, are moderate for groundfish and for all species with M/H vulnerable EFH. Area scaled EFH values for species with M/H vulnerable EFH and species with H vulnerable EFH are high. Both of these alternatives would be effective at protecting vulnerable EFH, but would not protect as much rocky bottom as alternatives 3 or 4.

Population effects and ecosystem changes – Both of these alternatives include high proportions of benthic feeding and shrimp/fish eating fish and low proportions of amphipod eaters. The percent composition of principal groundfish species is moderate.

Summary – These two alternatives are mostly enclosed within the existing groundfish closures and thus include very little open access fishing areas. Economic impacts are very low and community impacts are dispersed throughout New England. Total EFH area values are moderate, but area-scaled EFH values are high. The amount of rocky substrate, relative to area, is higher then in Alternative 6 and the proportions of benthic feeding fish is high. Principal groundfish species composition is moderate. Overall, both of these alternatives are practicable. However, Option (a) does not provide the same level of long-term habitat protection to the existing Cod HAPC in Closed Area II as does Option (b). Therefore, Option (b) is the most practicable closed area alternative relative to the others under consideration.

5.3.11 EFH Assessment

5.3.11.1 Description of the Action

For a full description of the proposed action, please refer to Section 3.0.

5.3.11.2 Assessing Potential Adverse Impacts

5.3.11.2.1 Experts Opinion

See Types of Gear Effects in Gear Effects Evaluation and Vulnerability of Benthic EFH to Bottom-Tending Fishing Gears section. To summarize, positive and negative effects of otter trawls, scallop dredges, and hydraulic clam dredges from 32 of these publications are listed by substrate type in Table 176 - Table 179 along with recovery times (when known). Without more information on recovery times, it is difficult to be certain which of the negative effects listed in these tables last for, say, more than a month or two. In fact, it is difficult to conclude in some cases (e.g., furrows produced by trawl doors) whether the habitat effect is positive, negative, or just neutral. Despite these shortcomings in the information, the scientific literature for the NE region does provide some detailed results that confirm the previous determinations of potential adverse impacts of trawls and dredges that were based on the ICES (2001), NRC (2002), and Morgan and Chuenpagdee (2003) reports.

Physical Effects	**Recovery**
Doors produce furrows/berms	2-18 months
Repeated tows increase bottom roughness	
Re-suspension/dispersal of fine sediments	
Rollers compress sediments	
Smoothing of surface features	
Biological Effects	
Reduced infaunal abundance	Within 3 ½ months (1 of 2 studies)
Reduced number of infaunal species	Within 3 ½ months
Reduced abundance of polychaete/bivalve species	Within 3 ½ months (1 of 2 studies)
Increased food value of sediments	
Increased chlorophyll production of surface sediments	
Removal/damage of epifauna	
Reduced abundance of brittlestars	
Increased number of infaunal species	
Increased abundance of polychaetes	
Decreased abundance of bivalves	
Altered community structure	18 months

Table 176. Effects and Recovery Times of Bottom Otter Trawls on Mud Substrate in the Northeast Region as Noted By Authors of Eight Gear Effect Studies.

Physical Effects	**Recovery**
Doors produce furrows/berms	Few days – a year
Smoothing of surface features	Within a year
Re-suspension/dispersal of fine sediments	No lasting effects
Biological Effects	
Mortality of large sedentary and/or immobile epifaunal species	
Reduced density of attached macrobenthos	
Removal/damage of epifauna	
Reduced abundance of polychaetes	
Reduced abundance/biomass of epibenthic organisms	
Reduced biomass/average size of many epibenthic species	
Epifauna (sponges/anemones) less abundant in closed areas	

Table 177. Effects and Recovery Times of Bottom Otter Trawls on Sand Substrate in the Northeast Region as Noted By Authors of Twelve Gear Effect Studies.

Physical Effects	Recovery
Displaced boulders	
Removal of mud covering boulders and rocks	
Groundgear leave furrows	
Biological Effects	
Reduced abundance of attached organisms (sponges, anemones, soft corals)	
Damaged sponges, soft corals, brittle stars	12 months

Table 178. Effects and Recovery Times of Bottom Otter Trawls on Gravel and Rock Substrate in the Northeast Region as Noted By Authors of Three Gear Effect Studies.

Physical Effects	Recovery
Disturbed physical/biogenic structures	
Loss of fine surficial sediments	More than 6 months
Reduced food quality of sediments	Within 6 months
Biological Effects	
Reduction in total number of infaunal individuals	Within 6 months
Reduced abundance of some species (polychaetes/amphipods)	
Decreased densities of two megafaunal species	

Table 179. Effects and Recovery Times of Chain Sweep Scallop Dredges on Sand Substrate in the Northeast Region as Noted By Authors of Three Gear Effect Studies.

The following conclusions can therefore be reached:

1. Adverse and potentially adverse habitat impacts from bottom trawling occur throughout most of the NE region on a variety of substrates;

2. Adverse and potentially adverse habitat impacts from scallop dredging occur primarily in the Mid-Atlantic and secondarily on Georges Bank on sand, gravelly sand, and gravel substrates;

3. Adverse and potentially adverse habitat impacts from hydraulic clam dredging occur primarily in the Mid-Atlantic and secondarily in southern New England on sand substrates.

5.3.11.2.2 Determinations

New Bedford scallop dredges and Otter trawls will have a potential adverse effect on the EFH of species and benthic habitat types listed in Table 180. These species and life stages have been determined to be moderately or highly vulnerable to these gear types. In some cases the adverse effects may be significant (high vulnerability) and are denoted in Table 180 as well. For a detailed look at the full gear effects evaluation and adverse impacts determination, refer to Gear Effects Evaluation section in Volume II of the Amendment 13 FSEIS.

Species	Lifestage	Vulnerability to Otter Trawling	Vulnerability to Scallop Dredging	Depth in meters (EFH Designation)	Substrate (EFH Designation)
American Plaice	A	High	High	45-150	sand or gravel
American Plaice	J	Mod	Mod	45-175	sand or gravel
Atlantic Cod	A	Mod	Mod	25-75	cobble or gravel
Atlantic Cod	J	High	High	10-150	rocks, pebble, gravel
Atlantic Halibut	A	Mod	Mod	20-60	sand, gravel, clay
Atlantic Halibut	J	Mod	Mod	100-700	sand, gravel, clay
Barndoor Skate	A	Mod	Mod	0-750, mostly <150	mud, gravel, and sand
Barndoor Skate	J	Mod	Mod	0-750, mostly <150	mud, gravel, and sand
Black Sea Bass	A	High	High	20-50	structures, sand and shell
Black Sea Bass	J	High	High	1-38	rough bottom, shell and eelgrass beds, structures and offshore clam beds in winter
Clearnose Skate	A	Mod	Mod	0-500, mostly <111	soft bottom along shelf and rocky or gravelly bottom
Clearnose Skate	J	Mod	Mod	0-500, mostly <111	soft bottom along shelf and rocky or gravelly bottom
Haddock	A	High	High	35-100	pebble gravel
Haddock	J	High	High	40-150	broken ground, pebbles, smooth hard sand, smooth areas between rocky patches
Little Skate	A	Mod	Mod	0-137, mostly 73-91	sand or gravel or mud
Little Skate	J	Mod	Mod	0-137, mostly 73-91	sand or gravel or mud
Ocean Pout	A	High	High	<110	soft sediments
Ocean Pout	J	High	High	<80	smooth bottom near rocks or algae
Ocean Pout	L	High	High	<50	close to hard bottom nesting areas
Ocean Pout	E	High	High	<50	hard bottom, sheltered holes
Pollock	A	Mod	Mod	15-365	hard bottom, artificial reefs
Red Hake	A	Mod	Mod	10-130	sand and mud

Table 180 – Summary species and life stage's EFH adversely impacted by otter trawling and scallop dredging (gears that adversely impact EFH used in the Scallop fishery).

Red Hake	J	High	High	<100	shell and live scallops
Redfish	A	Mod	Mod	50-350	silt, mud, or hard bottom
Redfish	J	High	High	25-400	silt, mud, or hard bottom
Rosette Skate	A	Mod	Mod	33-530, mostly 74-274	soft substrates including sand/mud and mud
Rosette Skate	J	Mod	Mod	33-530, mostly 74-274	soft substrates including sand/mud and mud
Scup	J	Mod	Mod	0-38	inshore sand, mud, mussel and eelgrass beds
Silver Hake	J	Mod	Mod	20-270	all substrate types
Smooth Skate	A	High	High	31-874, mostly 110-457	soft mud, sand, broken shells, gravel and pebbles
Smooth Skate	J	Mod	Mod	31-874, mostly 110-457	soft mud, sand, broken shells, gravel and pebbles
Thorny Skate	A	Mod	Mod	18-2000, mostly 111-366	sand gravel, broken shell, pebble, and soft mud
Thorny Skate	J	Mod	Mod	18-2000, mostly 111-366	sand gravel, broken shell, pebble, and soft mud
Tilefish	A	High	Low	76-365	rough, sheltered bottom
Tilefish	J	High	Low	76-365	rough, sheltered bottom
White Hake	J	Mod	Mod	5-225	pelagic during pelagic stage and mud or fine sand during demersal stage
Winter Flounder	A	Mod	Mod	1-100	estuaries with mud, gravel, or sand
Winter Skate	A	Mod	Mod	0-371, mostly <111	sand, gravel, or mud
Winter Skate	J	Mod	Mod	0-371, mostly <111	sand, gravel, or mud
Witch Flounder	A	Mod	Low	25-300	fine-grained sediment
Witch Flounder	J	Mod	Low	50-450	fine-grained sediment
Yellowtail Flounder	A	Mod	Mod	20-50	sand and mud
Yellowtail Flounder	J	Mod	Mod	20-50	sand and mud

Table 180 – Summary species and life stage's EFH adversely impacted by otter trawling and scallop dredging (gears that adversely impact EFH used in the Scallop fishery).

5.3.11.3 Minimizing or Mitigating Adverse Impacts

In order to minimize and mitigate the adverse effects of the fishery on EFH the Council will implement Habitat Alternative 2 (Benefits of other Amendment 13 alternatives), Alternative 7 (Expand the list of gears prohibited in year-round closed areas to include clam dredges), and Alternative 10b (Compromise Habitat Closure Areas). Habitat Alternative 10b will prohibit groundfish gear from fishing in vulnerable areas containing the above benthic habitat types. Alternative 7 will prohibit clam dredges from accessing portions of groundfish closed areas they were permitted to access in the past. Additionally, Alternatives 2 will be implemented to further mitigate the adverse effects of the fishery on EFH.

5.3.11.3.1 Habitat Alternative 2

Some of the non-habitat-related management measures in Amendment 13 are likely to provide benefits to essential fish habitat in the region. This alternative will rely on the habitat benefits of other non-habitat management measures that are implemented in Amendment 13 to meet the EFH provisions of the MSA. Depending on which measures are adopted, those benefits may or may not satisfy the EFH provisions of the MSA. summarizes the expected habitat benefits of the proposed non-habitat management measures that are being considered by the Council in Amendment 13.

Alternative	Overall Habitat Impact	Feature	Description of Habitat Impact
Observer Coverage	Indirect benefits (+)	10% requested by 2006 for each gear type	If observers are able to collect data of interest to EFH management, increased coverage could indirectly benefit habitat.
(3.5) Alternatives to Control Capacity	Positive Impact (+)	DAS can be transferred with restrictions and new measures for "reserve days"	Any measure that is intended to reduce the amount of time fishing by mobile gear will likely have benefits to EFH. These measures reduce amount of latent effort as well.
(3.6) Management Measures to Address Rebuilding Requirements	Overall Positive Impact (+)	Mix of adaptive and phased reduction strategies. Provides opportunity to fish on stocks that do not need rebuilding	The effort reductions, year-round closed areas, and existing gear modifications are likely to have positive impacts on EFH.
Effort Controls	Positive Impact (+)	A days (60% of effective effort) B days (40% of effective effort) C days (FY01 allocation)	Reducing DAS will likely benefit EFH by reducing the amount of time vessels can fish. There are studies that document the recovery of benthic habitats following the cessation of bottom fishing.
Closed Areas	Positive Impact (+)	Addition of Cashes as a year round closure	Year-round closures provide habitat benefits to the areas within the closures. The addition of Cashes Ledge as a year-round closure will benefit the EFH and rare kelp beds found in that area.

Table 181 – Summary of the potential habitat benefits of non-habitat measures proposed in Amendment 13.

Note: Seasonal (rolling) closures, possession limits, and hard TACs that are included in a number of proposed management measures are not considered to provide any significant habitat benefits. Habitat benefits identified above apply primarily to bottom trawls, not to fixed gear such as hooks and gill nets

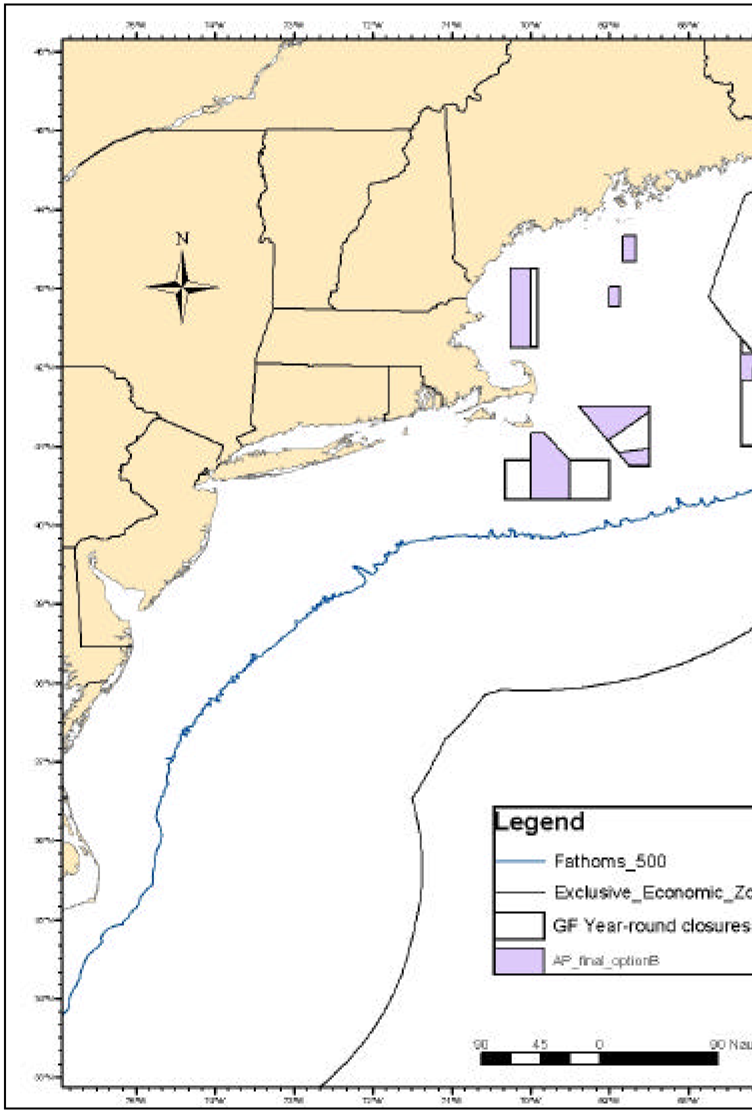
5.3.11.3.2 Habitat Alternative 7

This alternative will expand the list of fishing gears prohibited from use in the year-round closed areas to include clam dredges. This gear is allowed in portions of the existing groundfish closed areas and, due to their impacts, excluding their use will better protect essential fish habitat.

5.3.11.3.3 Habitat Alternative 10b

The Council selected Habitat Alternative 10, Option (b) to implement under Amendment 13 to the Northeast Multispecies FMP to minimize the adverse impacts of fishing as demonstrated in the Adverse Impact Determination section. Refer to 3.7.3 for a complete description of this measure.

This action identifies several areas as habitat closures. These areas are a Level III habitat closure, with one exception This alternative was developed to incorporate areas that would benefit EFH, but not in the most productive fishing grounds. Both existing mortality closures and proposed habitat closures were modified to develop one alternative that closes sensitive habitat. In general, the alternatives suggest changing the eastern boundary of the Western Gulf of Maine closure, and modifying the Nantucket Lightship closure. In addition, the access areas used in Framework 13 for Closed Area I were modified slightly. Lastly, the habitat closure proposals for Closed Area II, Jeffrey's, Bank, and Cashes Ledge were included in this alternative, with some modifications.



Coordinates for 10b				
	Longitude (Deg, Min)		Latitude (Deg, Min)	
Closed Area	67	20	42	10
	67	9.3	42	10
	67	0.5	42	0
	67	10	42	0
	67	10	41	50
	67	20	41	50
WGOM	70	15	43	15
	70	0	43	15
	70	0	42	15
	70	15	42	15
Cashes	69	3.22	43	1.14
	68	51.56	43	1.14
	68	51.56	42	45
	69	3.22	42	45
Jeffreys	68	50	43	40
	68	40	43	40
	68	40	43	20
	68	50	43	20
Nantucket	70	0	41	10
	69	50	41	10
	69	30	40	50
	69	30	40	20
	70	0	40	20
Closed Area	69	22.8	41	30
	68	30	41	30
	68	30	41	26
	69	1	41	4
Closed Area	68	53	40	55
	68	30	40	58
	68	30	40	45
	68	45	40	45

Figure 172 - Proposed habitat closures (Alternative 10b)

5.3.11.3.4 Analysis of Alternatives to Minimize Adverse Effects of Fishing on EFH

For a full analysis of the alternatives selected to minimize or mitigate adverse effects from fishing on EFH in Amendment 13 to the Multispecies FMP, see Section 5.3.8.

5.3.11.4 Conclusion

The management measures, implemented through this action, minimize the adverse effects of fishing on EFH, to the extent practicable pursuant to Section 303(A)(7) of the MSA).

5.3.12 Stellwagen Bank Habitat Research Area

The current WGOM Closed area includes a section of the Stellwagen Bank National Marine Sanctuary (SBNMS), referred to as "the sliver." The SBNMS is making a significant investment in research in the "sliver" and surrounding area that will exceed over $4 million in funding over this decade (Figure 173). This research closure provides an unprecedented opportunity to understand the impacts of fishing gear on habitat, and the recovery of from those impacts.

There are several properties of the WGOM/SBNMS overlap that make it an excellent choice for a habitat research area. These properties include scientific, practical, and political elements.

- The area includes the four major habitat types found in SBNMS and in the Gulf of Maine—boulder, gravel, mud and sand. This will enhance the exportability of any research results to areas outside the reserve. Further, the habitats are distributed on either side of the closed area boundary, making comparative habitat studies possible across the boundary.

- The proximity of the area to the ports of Boston, Gloucester, Scituate, Plymouth and Provincetown make it accessible to researchers for day trips using small and relatively inexpensive vessels, including fishing vessels.

- The area has already been closed to fishing for approximately 3 years. From a scientific perspective, this greatly enhances our ability to study the ecological processes and expedites the timeline on which results of research will be attained.

Several on-going studies are being conducted in the closed area. The SBNMS initiated a Seafloor Habitat Recovery Monitoring Program in 1998 to look at rates of recovery from fishing in the four major habitat types found in the Gulf of Maine. Three years of data now exist for the eight monitoring stations inside and outside of the closed area. A 10-year continuation of this study of seafloor habitat recovery following cessation of anthropogenic disturbance (e.g., fishing and fiber optic cable installation) begins in summer 2001. Other current projects in the closed area include the quantification of fish movement rates relative to seafloor habitat and species-area relationships of multiple taxa. This research is supported by NMFS, NEFMC and SBNMS.

Also, the WGOM/SBNMS seafloor has been mapped in its entirety by the U.S. Geological Survey. One of the key issues for a Gulf of Maine research reserve is the generalized applicability of research conducted there to other sites. The four habitat types in SBNMS and WGOM are essentially the four major habitat types in the Gulf of Maine. Assuming that only one site will be designated as a habitat research area in the near future, the WGOM/SBNMS closed area provides the greatest opportunity to generalize research results to other areas due to the range of habitats it contains. The high resolution mapping completed provides for unprecedented specificity in the selection of research sites for a range of projects, and is a notably invaluable asset.

The area closures being considered in this action will not affect the research stations that are inside the current WGOM closed area. Some of the proposed closures will reduce fishing activity in the vicinity of the stations outside the current WGOM closed area. For example, rebuilding Alternative 1 will either close the area inshore of the WGOM closed area, or will charge DAS at a differential rate. This may lessen the utility of these stations for comparing habitat subject to fishing pressure with that subject to less pressure inside the closed area.

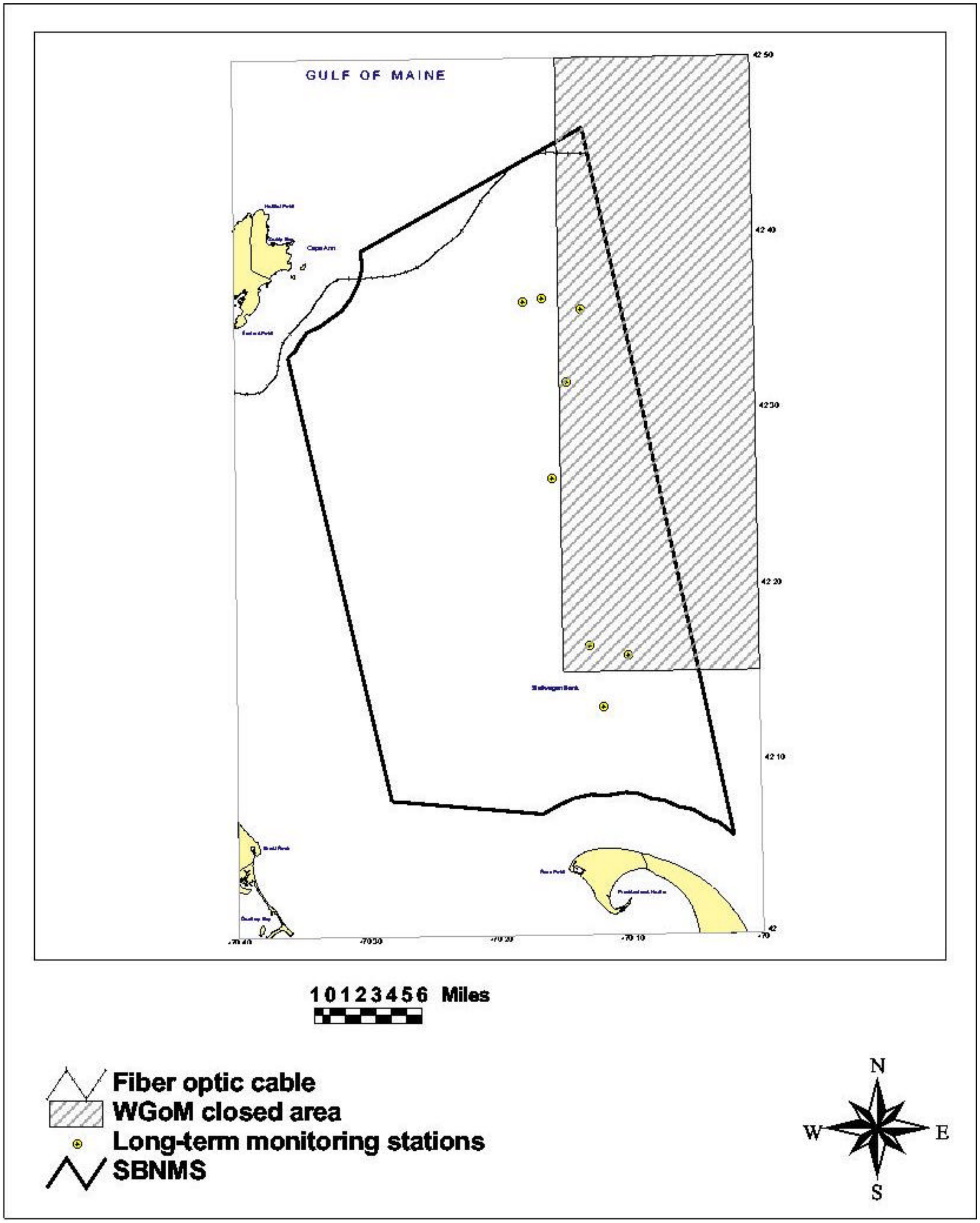


Figure 173 - Map depicting SBNMS boundary, truncated WGOM closure area, fiber optic cable route through SBNMS, and long-term Seafloor Habitat Recovery Monitoring stations.

5.4 Economic Impacts

This section describes potential economic value of the different rebuilding programs. The economic effects of the proposed action are evaluated from both a longer and short-term perspective. This analysis was developed using a national benefit perspective and estimates the present value of consumer and producer surpluses for all stocks. The Council considered two different rebuilding time frames (an end date of 2009 or 2014 for selected stocks) and three different rebuilding strategies (constant fishing mortality at an F-rebuild, phased fishing mortality, and an adaptive approach) in addition to the No Action alternative. In addition, the rebuilding strategies are also compared to the Status Quo – that is, maintaining 2002 fishing mortality rates into the future. The proposed action rebuilds most stocks by 2014, but uses a combined rebuilding strategy approach. Some stocks are rebuilt using the adaptive strategy, and some stocks are rebuilt using a phased reduction strategy.

In this section, the economic value of the proposed action is presented first. The non-selected alternatives are presented next – first for the strategies using a 2009 rebuilding time frame, then followed by an evaluation of the economic value of a 2014 rebuilding time frame. The difference in economic benefit between the two rebuilding time frames is evaluated in a subsequent section. Finally, there is a comparison between the proposed action and the other rebuilding strategies that uses a 2014 ending date for most stocks.

Each of the rebuilding alternatives provide for a specified suite of fishing mortality rates designed to achieve biological objectives for all stocks subject to rebuilding within the selected time frame. Applying these fishing mortality rates in a projection framework results in a set of projected landings and revenues under ideal conditions. That is, the resulting landings projections are what would result with perfect management such that every fishing mortality target for every stock was achieved. Realized landings may be higher, but are more likely to be lower for some key stocks because they coexist with others for which management measures are, by necessity, more restrictive. For this reason, the following should be regarded as an assessment of the longer term benefit of the policy decision to pursue a rebuilding plan, as well as which rebuilding approach yields highest net benefit, as compared to maintaining current management targets. From this perspective, the analysis is illustrative of the potential economic yield that may be derived from a rebuilding strategy but is not necessarily matched with a specific suite of management measures specifically designed to achieve the rebuilding targets over time. The difference between the projected and estimates of realized landings is evaluated in a concluding section. This analysis is based on a comparison between the projected landings for 2004 and the estimated landings from the area closure model used to estimate the short-term biological and distributive economic impacts of the selected management alternatives. Differences between the two estimates of 2004 landings may highlight areas of concern or identify candidate fisheries for special access programs (the proposed Georges Bank yellowtail special access program, for example).

Present Value of Regulatory Action

Net national benefit may be measured by the economic surpluses that accrue to a fishery. These surpluses include consumer and producer surplus. Consumer surplus is associated with the value over and above the purchase price derived from having seafood available for consumption; the difference between what consumers may be willing to pay for fish and what they actually do pay. Producer surplus is a return to seafood harvesters over and above the resource cost of harvesting fish. Measurement of the present value of any given stream of seafood supplies requires a set of projected landings streams, a model to estimate price response to changing market supplies, and an estimate of harvesting costs.

Prices

The price and demand analysis departs somewhat from the traditional approach used in most plans and amendments, including the New England multispecies plan. The NEFSC recently funded a statistical analysis of the relationships among groundfish dockside prices through the CMER (Cooperative Marine Education and Research) Program with the University of Rhode Island. Researchers in the Department of Environmental and Natural Resource Economics found that with the exception of windowpane flounder and redfish, the prices of large mesh groundfish species were co integrated (Roheim in prep). That is, the prices of several species move together over long time periods. Further, the price of Atlantic cod determines the prices of haddock and flounders. These results mean that it is reasonable to aggregate the landings of most species into composite products when modeling dockside demand, and that the dockside price of cod is an exogenous variable in the demands for most other species. The role of cod prices is new for dockside demand analysis, but researchers have long suspected that most groundfish were close substitutes in markets for whitefish (Bockstael 1976).

The dockside demand model (see Appendix 16 for a more detailed discussion of methods) was specified as a system of price equations. The model reflects management's focus on principal stocks, practical considerations having to do with available data, and the co integration results. There are separate price equations for Atlantic cod, haddock, and yellowtail flounder. The price of redfish was also modeled separately because it was neither dependent on cod prices nor co integrated with the other large mesh species. The remaining large mesh species - i.e., haddock, white hake, winter flounder, American plaice, witch flounder, windowpane flounder, and pollock - were aggregated in a single equation.

The resulting price models capture trends in seafood demand as well as the interaction between supply and demand. The latter means that predicted prices decline with increased supplies. However, this effect is counterbalanced by trends in seafood demand that have tended to result in higher prices for a given seafood supply. The combined effects mean that prices may increase gradually over time, but for any given year, the predicted price for one rebuilding alternative that results in higher landings will be lower than another alternative with lower landings. For example, the phased fishing mortality strategy would result in lower predicted prices than a constant fishing mortality strategy in the early years of the program because projected landings would be higher. As the schedule of phased fishing mortality rates falls below the constant F the expected landings would be lower, hence predicted prices would be higher compared to expected landings at a constant fishing mortality rate.

Predicted prices in time t were standardized by multiplying the observed price in 2001 by the ratio of the predicted price in time t to the predicted price in 2001. In this manner predicted prices were converted to real or current 2001 relative prices. Estimates of consumer surplus were obtained by calculating the area under the demand function from zero to the quantity supplied and subtracting total revenues paid to vessels.

Costs
Fishing costs consist of fixed costs (costs that must be paid regardless of output levels) and variable costs. Variable costs consist of vessel operating costs and crew payments. However, since crew payments are based on a share basis that may be adjusted as economic conditions warrant only vessel operating costs were considered herein. Thus, the difference between gross revenues and fishing costs (fixed plus operating) represents a return to labor and owner profit. Note that this return is not producer surplus in the strict economic sense. A theoretically correct estimate of producer surplus would require an estimate of the opportunity cost of labor and capital. Since adequate data are not available on either employment or profitability in the groundfish fishery, returns are based on accounting definitions of "profit" rather than strict adherence to economic concepts. Fixed and operating costs were estimated from the survey data described in section 5.4.5.

Fixed Costs - Because vessels may be active in a number of different fisheries total fixed costs would normally be prorated across these activities rather than be assigned to groundfish alone. Fixed costs were estimated by multiplying the mean fixed cost by vessel gear and size group by the proportion of days absent where groundfish landed to total days absent. This calculation resulted in an estimate of $30.5 million per year in fixed costs (Table 182). Note that this calculation was based on 809 vessels. Since approximately 900-1,000 vessels have landed groundfish in the past, fixed costs may be underestimated but since all scenarios were evaluated in a consistent manner, the ordinal ranking across alternatives would not be affected.

Fixed costs were assumed to be borne throughout the time period of analysis even though the actual number of vessels may change. For example, if additional buyouts or some other capacity rationalization program were implemented, fixed costs would decline. At this time, an industry funded buyout is under discussion but the components of any such plan have yet to be developed.

Gear Group	Number of Vessels	Groundfish Days Absent (VTR)	Total Days Absent (VTR)	Ratio	Mean Fixed Cost per Vessel	Prorated Fixed Cost per Vessel	Total Fixed Cost
Small Hook	43	1,468	2,698	0.54	26,630	14,490	623,051
Large Hook	20	790	1,875	0.42	34,018	14,333	286,658
Small Trawl	181	10,606	18,469	0.57	30,073	17,270	3,125,817
Medium Trawl	216	14,232	23,928	0.59	66,937	39,813	8,599,625
Large Trawl	176	15,214	24,908	0.61	135,092	82,515	14,522,683
Small Gillnet	68	3,035	5,813	0.52	26,630	13,904	945,450
Large Gillnet	105	6,808	10,143	0.67	34,018	22,833	2,397,459
Total	809	52,153	87,834	0.56	50,485	29,308	30,500,744

Table 182 - Estimated Fixed Costs for Groundfish Vessels

Operating Costs - Vessel operating costs are affected by a mixture of expenditures some of which are dependent on output levels (handling and offloading fish) but the majority are associated with a combination of taking a fishing trip (food, bait, supplies) and time spent fishing (fuel). For purposes of analysis, operating costs were assumed to be correlated with annual changes in effort, which in turn were assumed to be linked to annual changes in DAS allocations of time spent fishing. Unfortunately, the management measures described in Section 3.6 do not detail how adjustments to the rebuilding program will be made over time. Nevertheless, since there is an assumed functional relationship between fishing mortality rates and effective effort, changes in operating costs were indexed to annual changes in the average projected fishing mortality rate for all age-based stocks. This approach permits consideration of the difference in operating costs that may be associated with different rebuilding approaches. For example, the constant F approach would require that effective effort be held constant while a phased reduction approach requires continual downward adjustments in effective effort. With an assumed relationship between effective effort and operating costs, fishing costs would remain relatively constant under the former but would decline under the latter rebuilding strategy.

Operating costs were estimated in a manner similar to that of fixed costs. Average operating costs by vessel gear and size groups (Table 232) were multiplied by DAS called-in for FY2001. This product was approximately $29 million (Table 183). Annual projected operating costs were then calculated from this baseline.

Gear Group	DAS Called-In FY2001	Mean Operating Cost	Total Operating Cost
Small Hook	1,145	362	414,505
Large Hook	938	344	322,608
Small Trawl	10,803	268	2,895,146
Medium Trawl	19,893	363	7,221,133
Large Trawl	21,098	814	17,173,772
Small Gillnet	2,691	50	134,572
Large Gillnet	7,852	94	738,088
Total	64,420		28,899,824

Table 183 - Estimated FY2001 Operating Costs

Projection Methods

Projections of annual landings, revenues, costs, consumer surplus, and returns to labor and owner profit were conducted using Monte Carlo simulation (1,000 realizations) procedures using @RISK. In this manner the full range of possible outcomes could be simulated and permits calculation of expected values as well as confidence intervals. In the simulation, the empirical distribution of landings from age-based assessments were replaced by fitted theoretical probability distributions using BestFit software. Adjustments to certain stocks were made to account for expected recreational landings and Canadian shares of landings. Specifically, 20 percent of Gulf of Maine cod was assumed to be landed by recreational anglers while the U.S. share of Georges Bank Yellowtail, Georges Bank cod, and Georges Bank haddock were set to 58%, 82%, and 40%, respectively. These shares were averaged based on reported U.S. and Canadian landings in the Multispecies Monitoring Committee Reports for 1996 - 2001. In the future, the U.S. share of these stocks may be determined by the US/Canada resource sharing understanding (see section 3.4.3) and may differ from these assumed values.

The simulation time period covered a twenty-three year span from 2003 to 2026. This time period is consistent with the prescribed rebuilding period for all stocks (except for redfish). All dollar values were discounted at an interest rate of 7-percent for purposes of calculating present values. Sensitivity analyses to determine the robustness of the ordinal ranking of alternatives was conducted using discount rates from 0 to 20 percent.

5.4.1 Economic Benefits of the Proposed Action

The Proposed Action would implement an overall rebuilding approach that would target Fmsy for stocks that require comparatively less effort reduction while adopting a phased approach for stocks that require larger reductions in effort. The combined rebuilding strategies that are being adopted are closely linked to the proposed management measures. For example, the rebuilding fishing mortality target for GB cod from 2004 through 2008 is based in part on the mortality that is expected to result from the proposed measures. This means that the estimated economic impacts of the proposed combined rebuilding strategy should more closely reflect the future realized landings and revenues under the adopted suite of management measures.

With this mixed approach, projected landings from all 10 large mesh species start out at 130 million pounds in 2003 and increase to 146 million pounds in 2004 (Figure 174). From 2004 onward, projected landings would continue to increase by about 15 million pounds per year through 2008. Based on the assumed fishing mortality rates for 2004 to 2008, for some stocks, adjustments to the management measures will be implemented in 2009. Therefore, fishing mortality rates that would be necessary to rebuild in the remaining time period were estimated and applied through 2014 for all stocks except Georges Bank cod (rebuilding in 2026) and Cape Cod/Gulf of Maine yellowtail flounder (rebuilding in 2023). Based on modeled performance from 2004 to 2008 the effort reduction required in 2009 would result in a one-year reduction of 11 million pounds; down from 206 million pounds in 2008. Projected landings would recover rapidly to 208 million pounds in 2010 and would increase by an average of 12 million pounds each year through 2014. Landings in 2015 would approach 300 million pounds as most stocks would be fished at MSY levels and would continue to increase to about 320 million pounds at the end of the rebuilding period in 2026.

Average projected revenues follow the same general pattern as landings with nominal gross revenues of $128 million in 2003 and increasing to $139 million in 2004 (Figure 175). The relative change in gross revenues is less than that of the change in landings as prices decline due to larger market supplies. For example, revenues decline less than half as much as that of landings in 2009 because the offsetting effect of price increases as market supplies go down. Similarly, revenues in 2015 do not increase as much as landings do, because of the price dampening effect of higher market supplies.

Average returns to crew and captain incomes and vessel owner profits were projected to be $68 million in 2003 and increase to $84 million in 2004 (Figure 176). In 2015, when all stocks except Cape Cod/Gulf of Maine yellowtail flounder are fished at MSY levels returns to crew and captain income and owner profit would be $240 million. The overall change in income and profit from 2003 to 2026 is actually larger than that of either landings or revenues because costs remain relatively constant from 2015 onward. With constant costs and increasing landings the share of revenue going to income and profits continues to get larger over time.

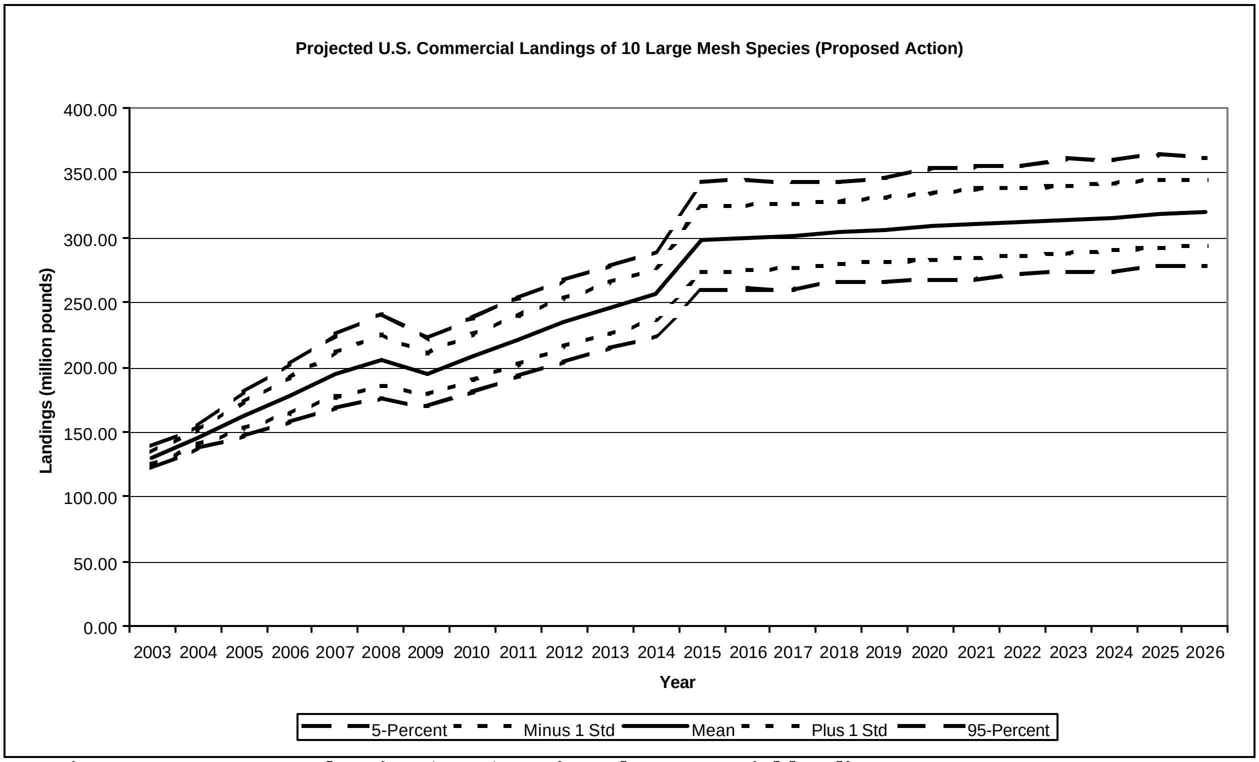


Figure 174 – Proposed action (2014) projected commercial landings

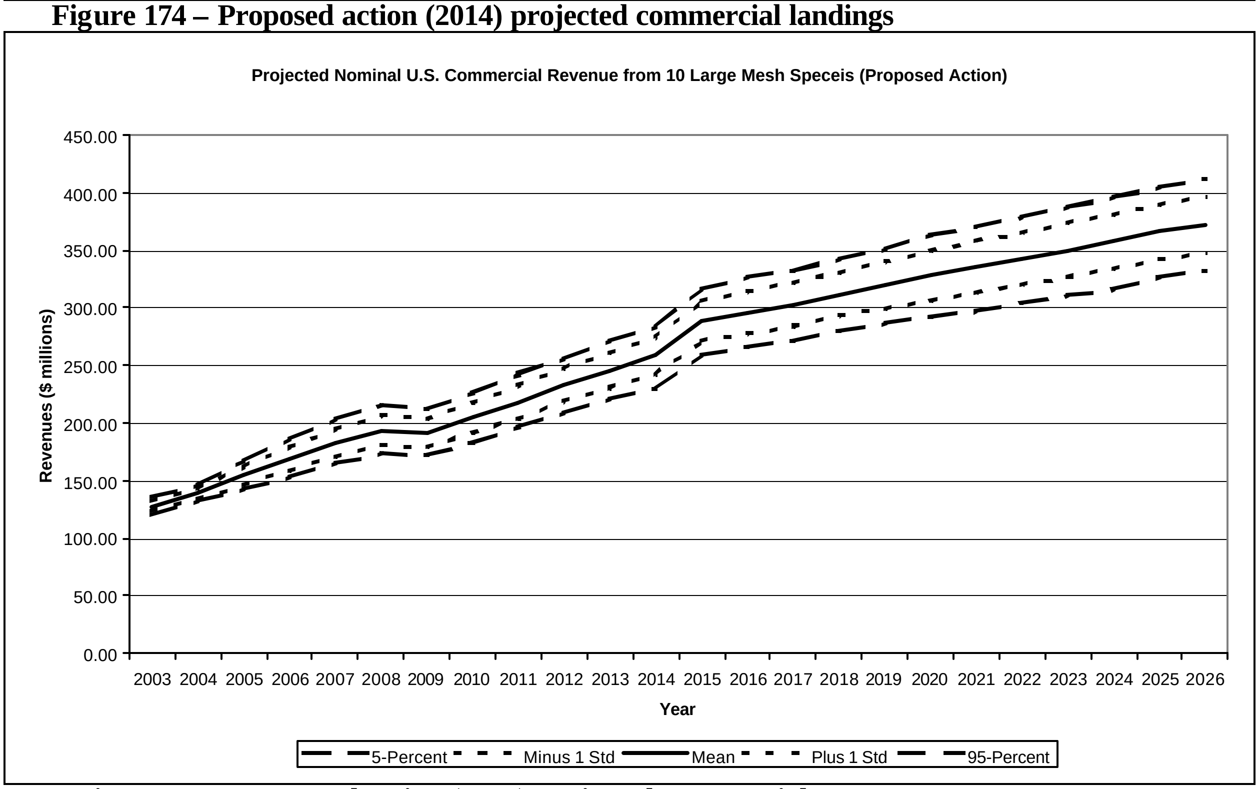


Figure 175 – Proposed action (2014) projected commercial revenues

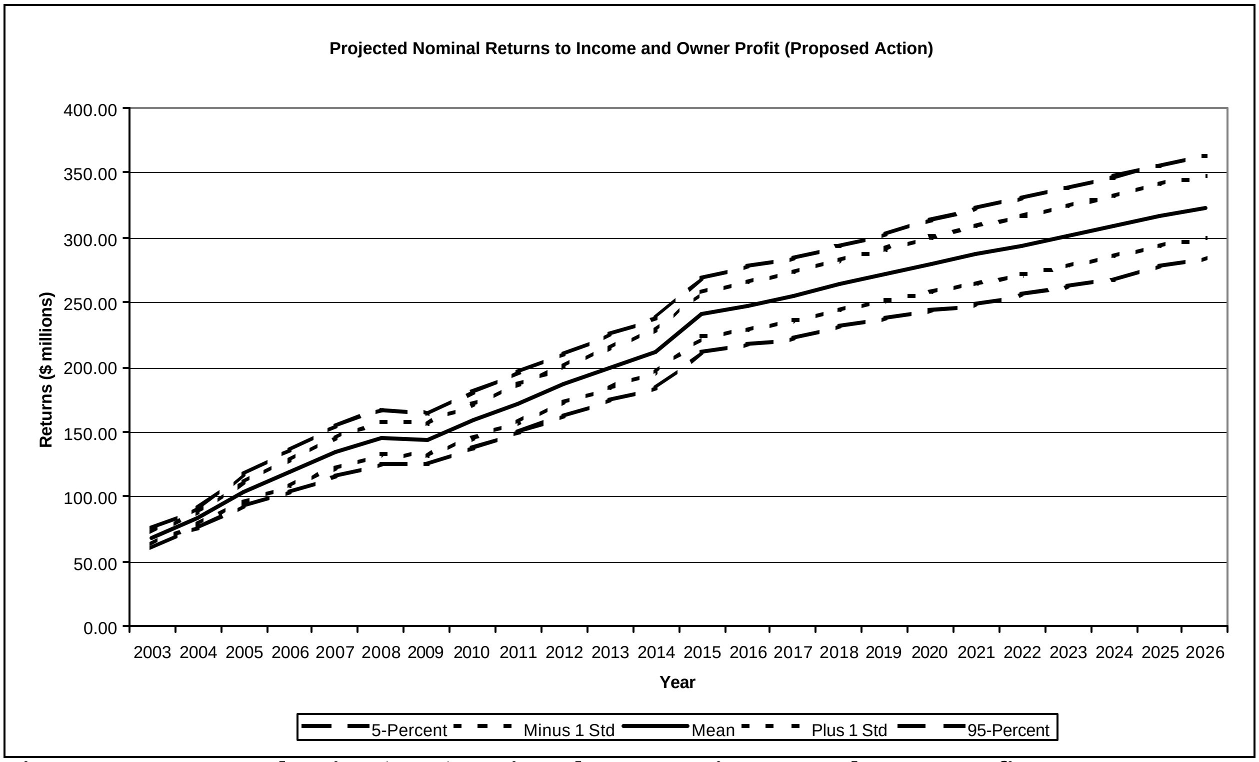


Figure 176 – Proposed action (2014) projected return on income and owner profit

5.4.2 Economic Benefit of Rebuilding Strategies Not Selected

This section summarizes the economic benefits of the alternatives to the proposed action that were considered by the Council. It includes, for reference only, the benefits of the status quo alternative. This alternative was not explicitly considered by the Council because it does not meet requirements to end overfishing and rebuild overfished stocks. Nevertheless, there was considerable interest in this information during the public comment period, so it is included in this document.

Section 3.2.2 describes the stocks that would effectively be managed to achieve rebuilding targets by 2009 with the indicated exceptions. Commensurate with this rebuilding time frame rebuilding fishing mortality rates were determined for both a constant fishing mortality rate strategy (F-Rebuild) and a sequence of phased reductions in fishing mortality rates (Phased-F). Since the rebuilding time frame would be comparatively short (five years from implementation) an adaptive management approach would be impractical so this rebuilding alternative was not developed for the 2009 rebuilding time.

Section 3.2.2 also described stocks that would be managed to achieve rebuilding targets by 2014 with the exception of redfish, Cape Cod/Yellowtail Flounder, and Georges Bank cod. With this rebuilding time frame rebuilding fishing mortality rates were determined for three rebuilding alternatives; a constant fishing mortality rate strategy (F-Rebuild), a phased reductions in fishing mortality rates (Phased-F), and an adaptive approach (Adaptive). The adaptive approach will involve an evaluation of progress toward rebuilding for each stock that would take place during 2008. In the interim all stocks would be fished at levels consistent with Fmsy. To develop an estimate of landings streams for the remaining years of the time frame the constant fishing mortality rate needed to rebuild the stock by the end of the rebuilding period was determined and applied from 2009 to 2014.

5.4.2.1 No Action Alternative

The No Action alternative would return the fishery management regulations back to those in place during fishing year 2001. The projections started with present (2002) stock sizes and 2002 fishing mortality rates but applied the estimated 2001 fishing mortality rates throughout the 2003-2026 projection period to all stocks. Based on these conditions the average value of landings started out at 127 million pounds from the 10 combined large mesh species and increased to 289 million pounds in 2026 (Figure 177). The majority of the increase in landings was projected to occur between 2003 and 2012. Thereafter, landings were projected to continue to increase but by less than 3 million pounds per year. The 95-percent confidence interval also stabilizes in 2012 suggesting that landings could be within the range of about 45 million pounds below the mean or about 55 million pounds above the mean.

Projected average nominal revenue streams begin at approximately $127 million in 2003 and increase to $344 million in 2026 (Figure 178). The estimated revenue streams increase almost linearly with time even though average landings do not increase appreciably after 2012. The linear increase is due to the estimated time trend in the price model. This annual time trend captures shifts in un-modeled factors (principally increases in the demand for seafood) that tend to result in higher prices paid for fish even though market supplies may be relatively constant from one year to the next.

Projected returns above fixed and operating costs were approximately $70 million (about 55% of fishing revenue) in 2003 and increased to $280 million in 2026 (Figure 179). These results suggest that returns to crew and captain payments and owner profit will increase from 55% to 81% of fishing revenue from 2003 to 2026. This projected increase results because while predicted groundfish prices are increasing with time operating costs and fixed costs were assumed to remain constant. The resulting calculated increase in profitability is certain to be overstated although some improvement in financial position may occur. Note that this effect will result in an upward bias in estimated economic benefits but this bias will also be embedded across all alternatives which serves as a reminder that the primary purpose of the analysis is to establish an ordinal ranking of alternatives rather than as providing a refined point estimate of economic benefit.

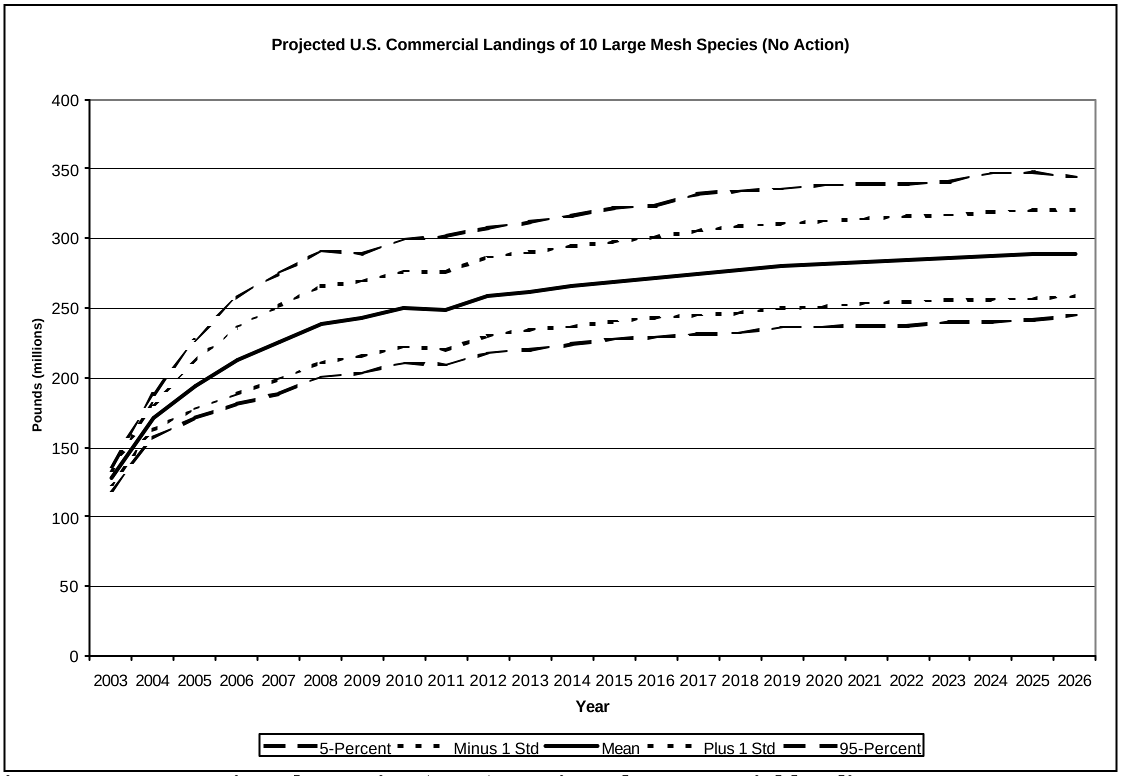


Figure 177 – No action alternative (2009), projected commercial landings

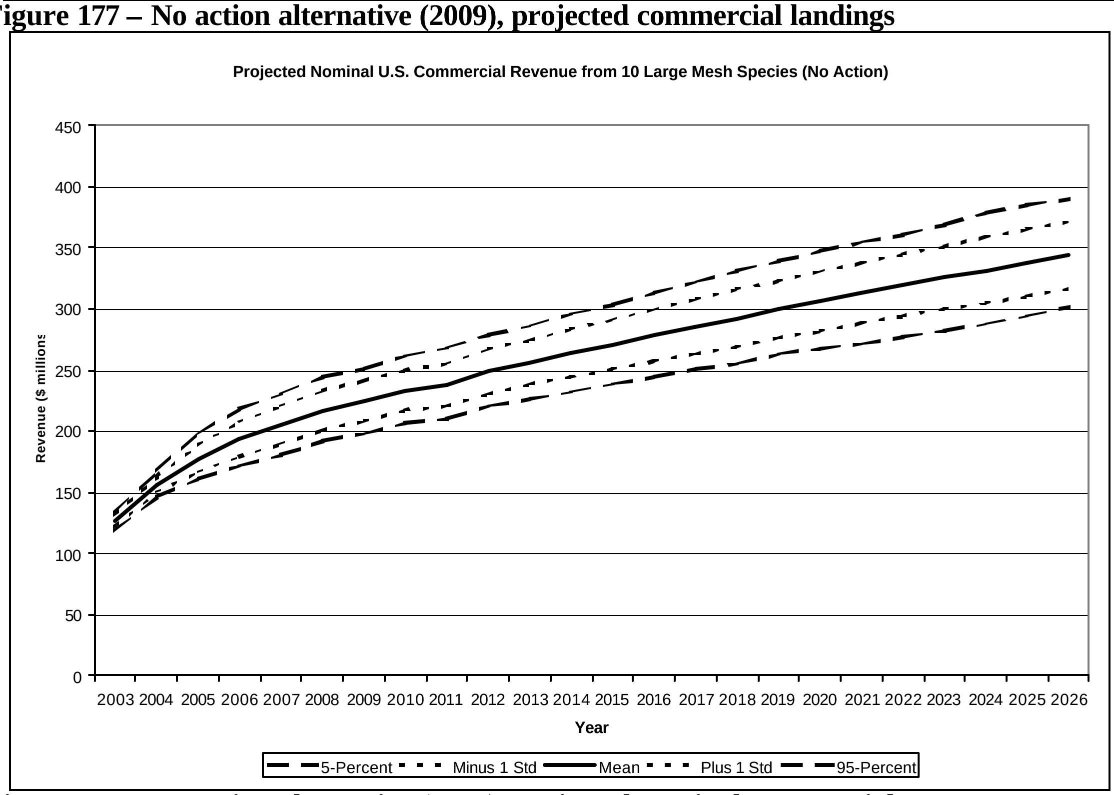


Figure 178 – No action alternative (2009), projected nominal commercial revenues

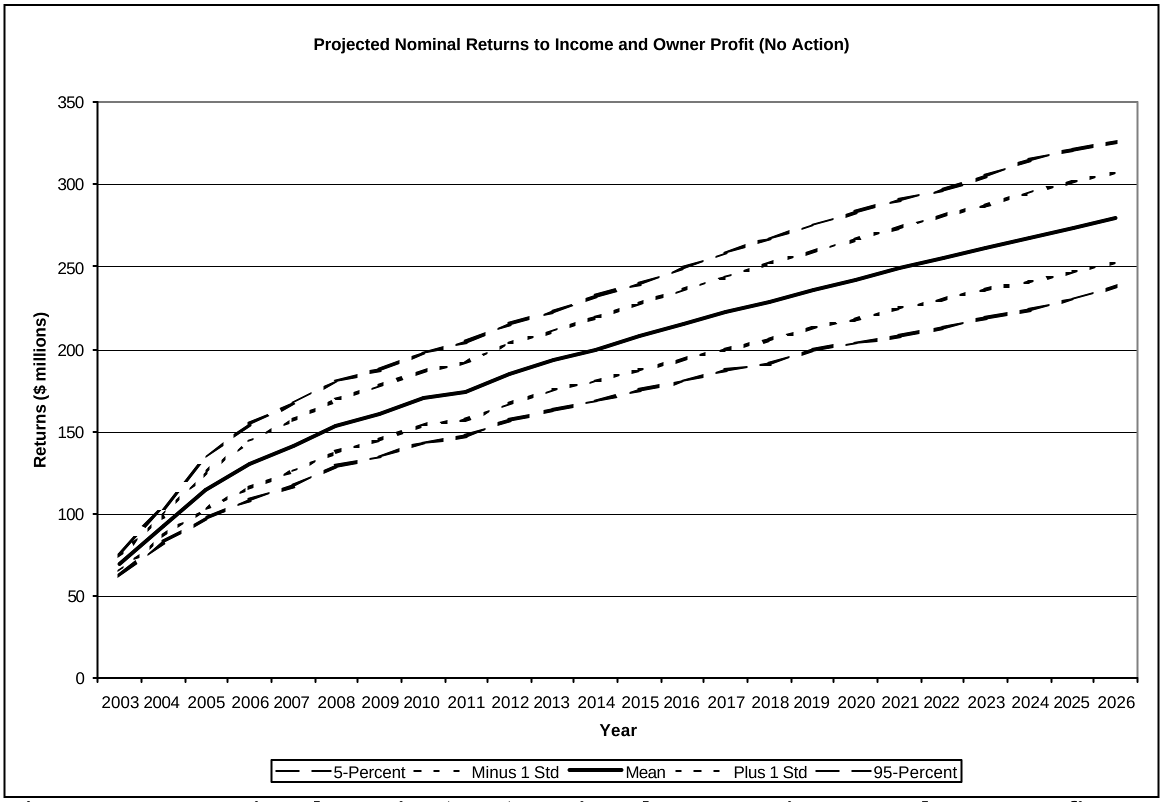


Figure 179 – No action alternative (2009), projected return on income and owner profit

5.4.2.2 Status Quo

The Council did not explicitly considering a Status Quo alternative because the management measures put in place as a result of the FW 33 lawsuit do not meet M-S Act rebuilding requirements. Nevertheless, the expected economic results from such a strategy are provided as a further comparison to the rebuilding strategies. Projections for the Status Quo alternative were conducted by applying estimated 2002 fishing mortality rates to present stock conditions and holding these mortality rates constant from 2003 to 2026. Average projected regulated large mesh groundfish landings were 124 million pounds in 2003 (Figure 180). Projected landings increased to 282 million pounds in 2026, about 7 million pounds less than that of the No Action alternative. In general, Status Quo projected landings followed a similar pattern to that of No Action but were consistently lower because in most cases 2002 fishing mortality rates were lower than that of 2001 given similar stock conditions.

Average projected nominal fishing revenue was $123 million in 2003 and was $335 million in 2026 (Figure 181). Even though predicted groundfish prices were slightly higher (since landings in any given year were lower) for the Status Quo than No Action, the difference in landings between the two alternatives more than offsets the higher predicted prices.

In 2003 average returns to income (payments to crew and captain) were $65 million, about 53% of gross revenues (Figure 182). By the end of the projection period total payments to income and owner profit averaged $277 million. The share of fishing income under the Status Quo is less than that of the No Action for a combination of reasons. First, estimated fixed costs were the same under both alternatives (i.e. fleet size and composition is held constant across all analyses). This means that even if operating costs were the same for any two alternatives the profit margin would be lower for the alternative with lower gross. Projected operating costs for the Status Quo were lower than No Action because of the assumed relationship between fishing mortality rates and operating costs. However, the relative difference in gross revenues between No Action and the Status Quo more than offsets the reduced operating costs resulting in lower income and profit payments after all costs have been paid to distribute to captains, crew and vessel owners.

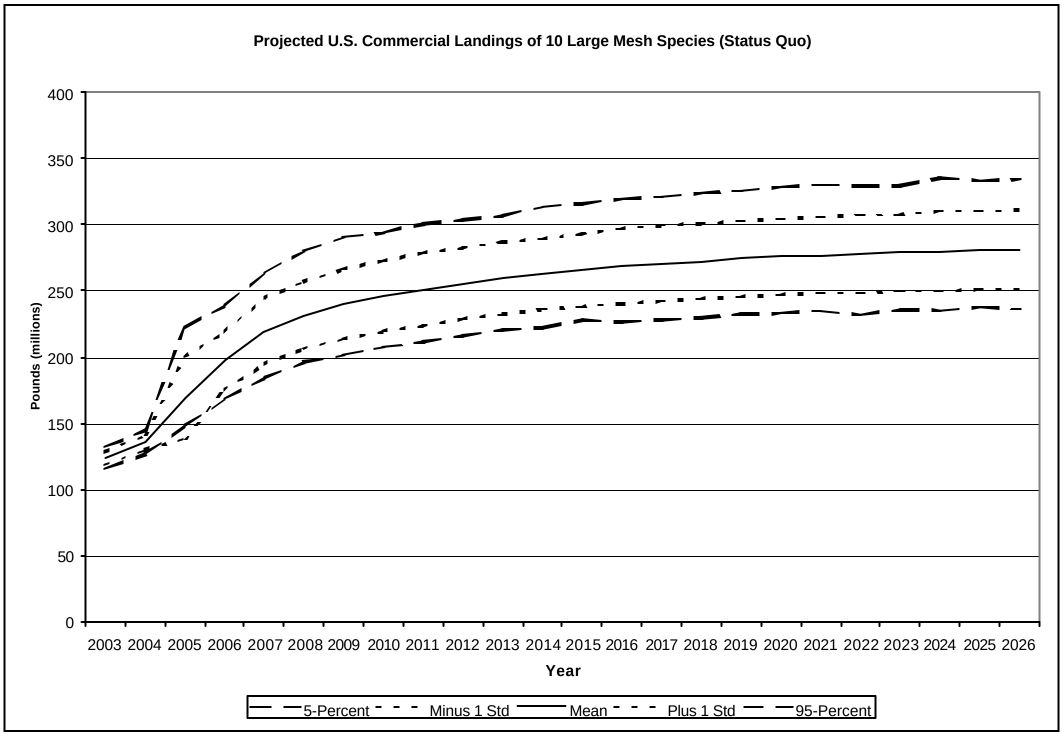


Figure 180 – Status quo, projected commercial landings

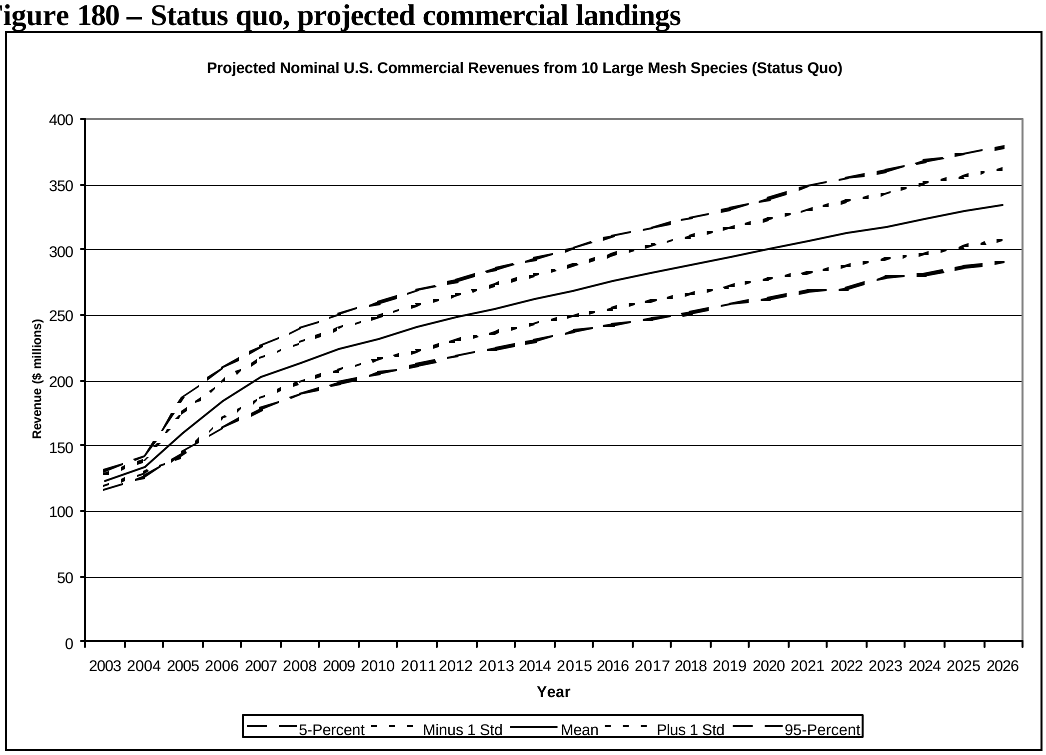


Figure 181 – Status quo, projected nominal commercial revenues

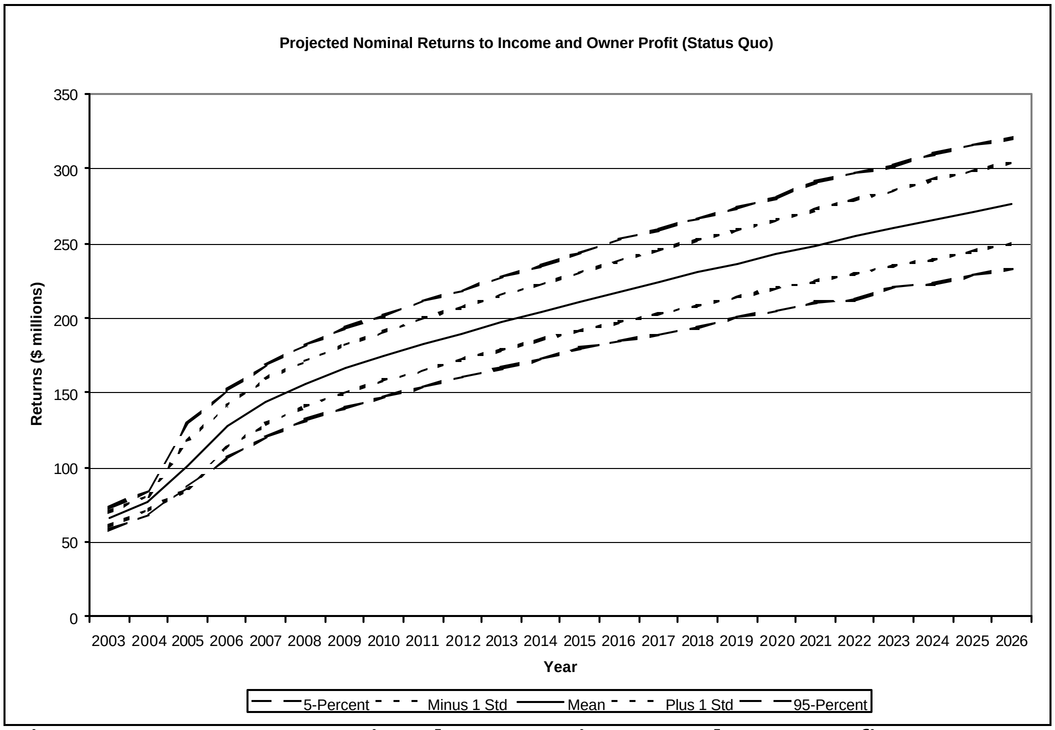


Figure 182 – Status quo, projected return on income and owner profit

5.4.2.3 Constant Fishing Mortality Rebuilding Strategy (2009)

Projected landings under a constant fishing mortality rate rebuilding strategy begin in 2003 at the same level as that of the status quo since each of these alternatives start with the same initial conditions and fishing mortality rates in 2003. The constant F rebuilding strategy begins in 2004 with estimated average landings of 120 million pounds (Figure 183). Note that this rebuilding option contains a mixture of stocks that must be rebuilt by 2009, others that have a rebuilding period ending in 2014, others (Georges Bank cod and Cape Cod/Gulf of Maine yellowtail flounder) with longer rebuilding time frames, and other stocks that are not subject to a rebuilding plan. Because of the mixture of rebuilding time frames, the projected landings exhibit several peaks in landings that correspond to a transition to fishing at MSY levels once the rebuilding objective has been attained. The more pronounced peaks occur in 2010 and 2015 as most stocks have entered a maintenance phase. Landings also increase in 2023 as Cape Cod/Gulf of Maine yellowtail is projected to be rebuilt. In 2026 projected landings averaged 322 million pounds; about 40 million pounds greater than the Status Quo and 33 million pounds greater than No Action.

The projected revenue streams follow a similar pattern to that of landings except that the revenue peaks are less pronounced (Figure 184) because of the dampening effect of price reductions that attend a relatively large increase in groundfish supplies. Average nominal revenue falls to $116 million between 2003 and 2004 but recovers to 2003 levels or greater by 2006. Projected nominal revenues increase to $375 million in 2026; $30 million more than the Status Quo and about $32 million more than No Action.

Average projected returns to income payments and owner profit were $71 million in 2004 (Figure 185); about $6 million less than Status Quo and $22 million less than No Action. The pattern of change in income and profit levels is similar to that of the projected revenues with an increase of $56 million occurring in 2010 as rebuilding objectives are met. Nominal returns increase to $327 million n 2026. However, as noted previously this estimate of income and profit is likely to be overstated since ex-vessel changes have been explicitly modeled while changes in fixed or input costs have not.

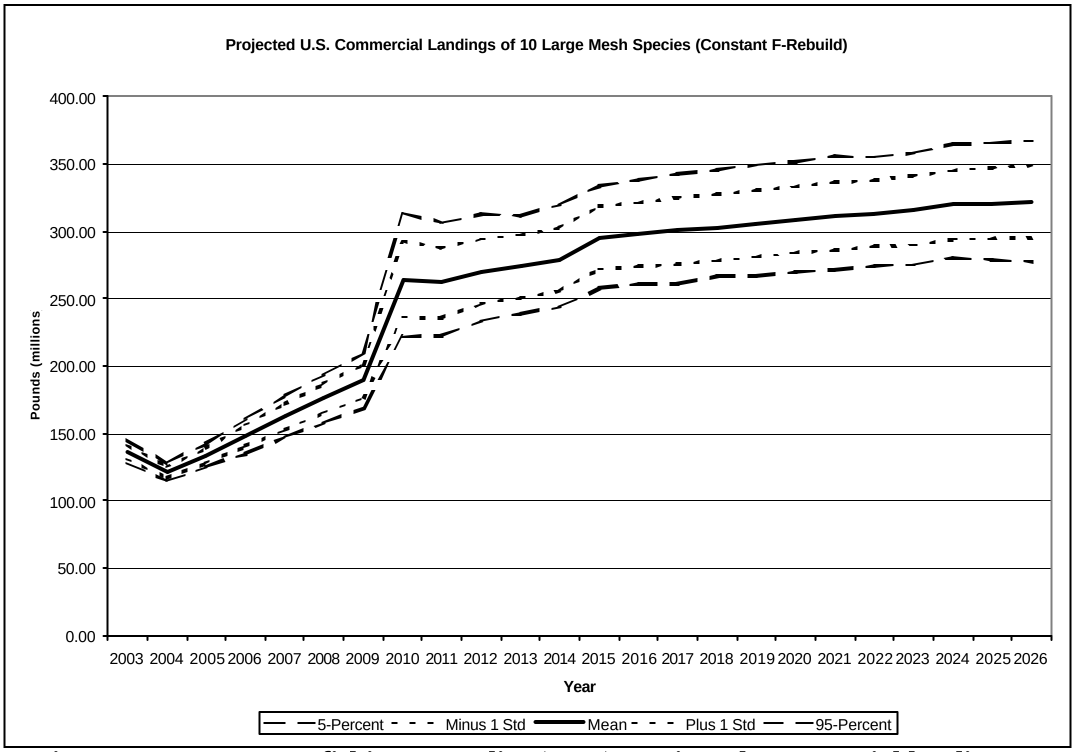


Figure 183 – Constant fishing mortality (2009), projected commercial landings

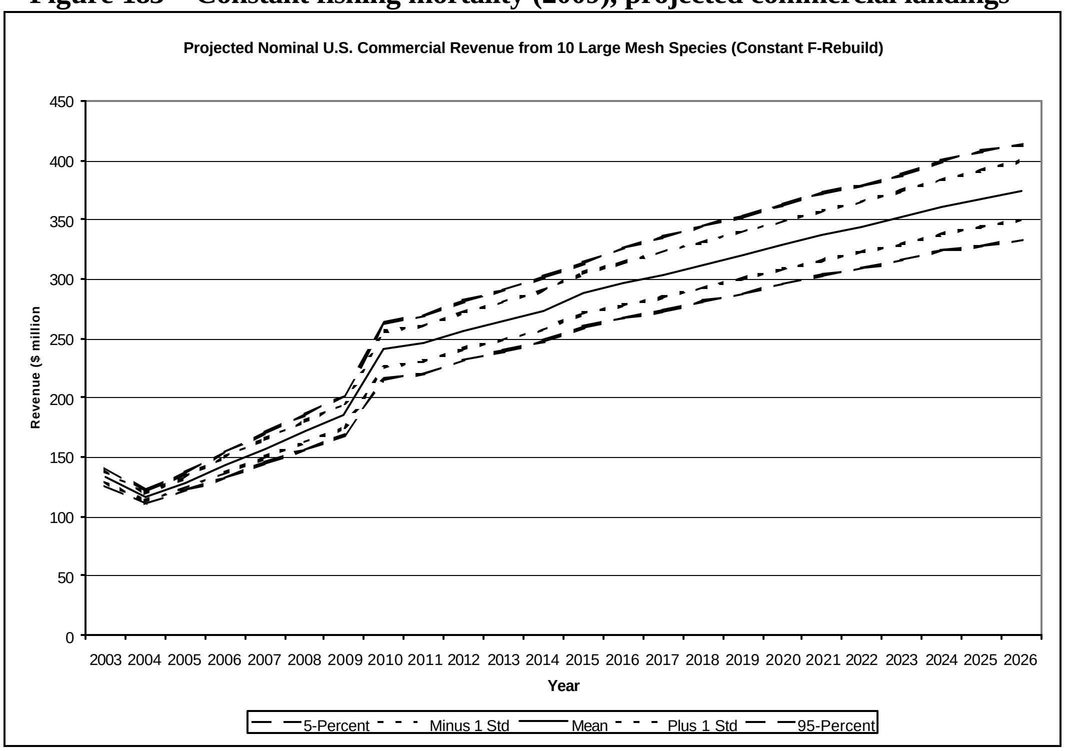


Figure 184 – Constant fishing mortality (2009), projected nominal commercial revenues

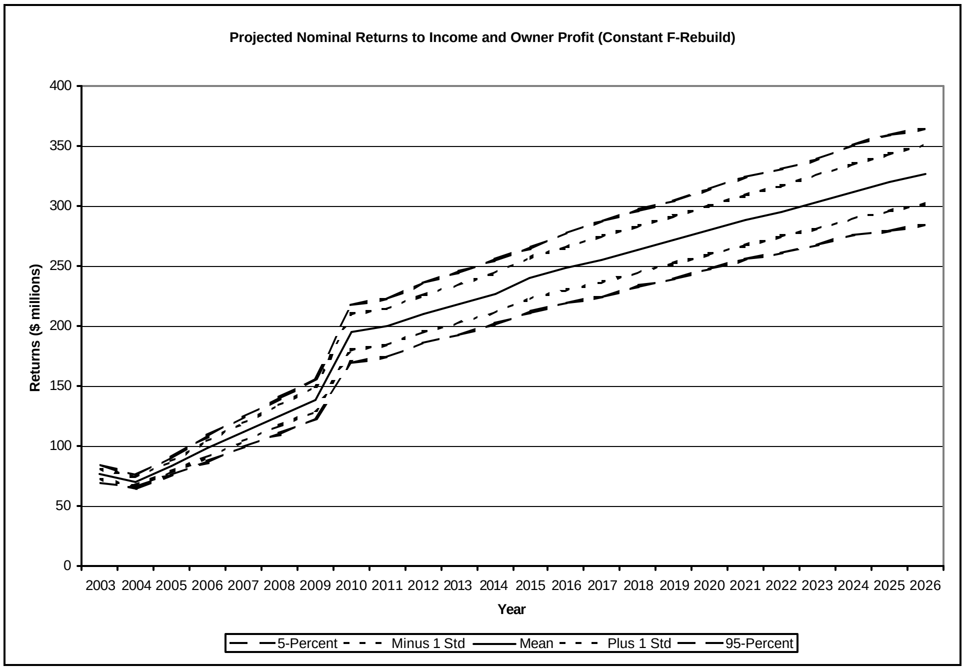


Figure 185 – Constant fishing mortality (2009), projected return on income and owner profit

5.4.2.4 Phased Fishing Mortality Rebuilding Strategy (2009)

The general pattern of landings over time under the phased fishing mortality rate rebuilding strategy is similar to the constant fishing mortality rate strategy in that there are distinct peaks in landings as stocks reach their rebuilding targets (Figure 186). The two strategies differ in that the phased rebuilding strategy does not exhibit the reduction in landings from 2003 to 2004 that occurs in the constant F strategy but that landings tend to be lower particularly for stocks like Georges Bank cod and Cape Cod/Gulf of Maine yellowtail flounder that have a longer rebuilding time as these stocks near completion of the prescribed rebuilding time. However, the difference between the two rebuilding strategies in terms of landings is not large and each result in identical outcomes once all stocks have been rebuilt.

Average gross revenues in 2004 were projected to be $134 million (Figure 187); about $21 million more than the constant fishing mortality alternative. As was the case for landings, the phased rebuilding strategy results in revenue streams that are higher than the constant fishing mortality alternative from 2003 to 2009. However, the phased strategy requires keep fishing mortality rates low throughout much of the remaining rebuilding period so that nominal revenues from 2009 to 2026 lie below that of the constant fishing mortality alternative. In all subsequent years, both alternatives would be expected to produce equivalent revenue streams.

The projected income to captains and crew as well as owner profit follow the same general pattern as that just described for gross revenues (Figure 188). Estimated operating costs would be higher while the phased fishing mortality rates were above those associated with a constant fishing mortality rate strategy but would be lower in later years. However, these later year cost savings are not offset by large enough increases in gross revenues so that nominal income and profit levels for the Phased alternative are less than that of the constant fishing mortality rebuilding strategy from 2010 to 2026. Once all stocks have been rebuilt then both alternatives would yield identical levels of profitability.

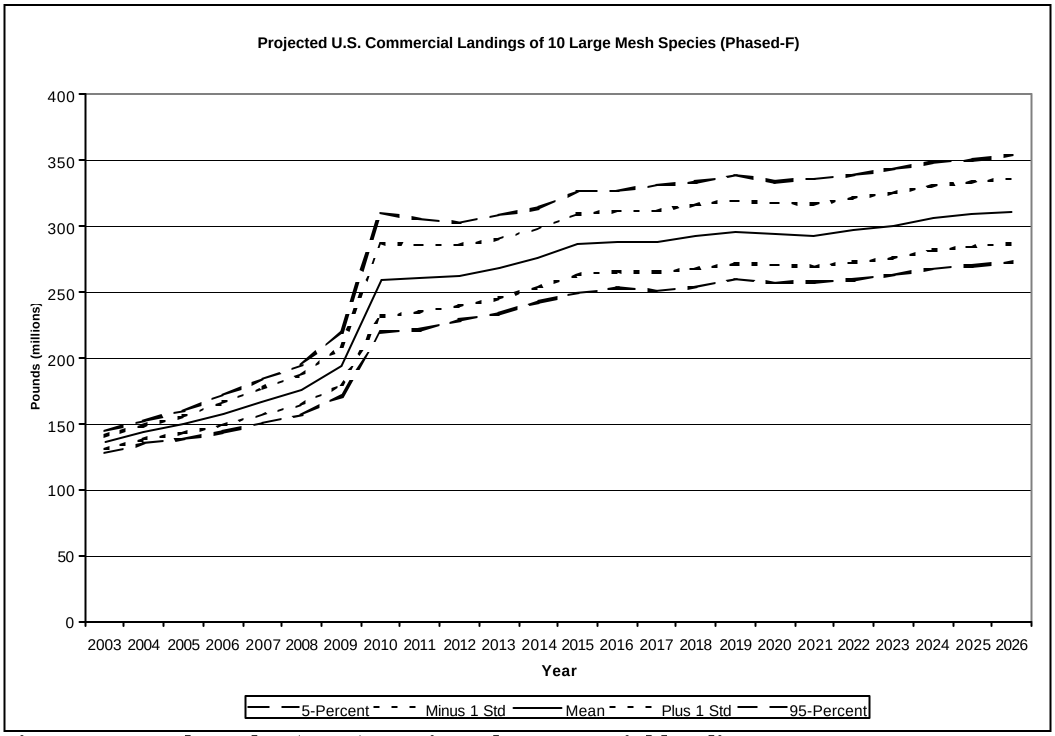


Figure 186 – Phased-F (2009), projected commercial landings

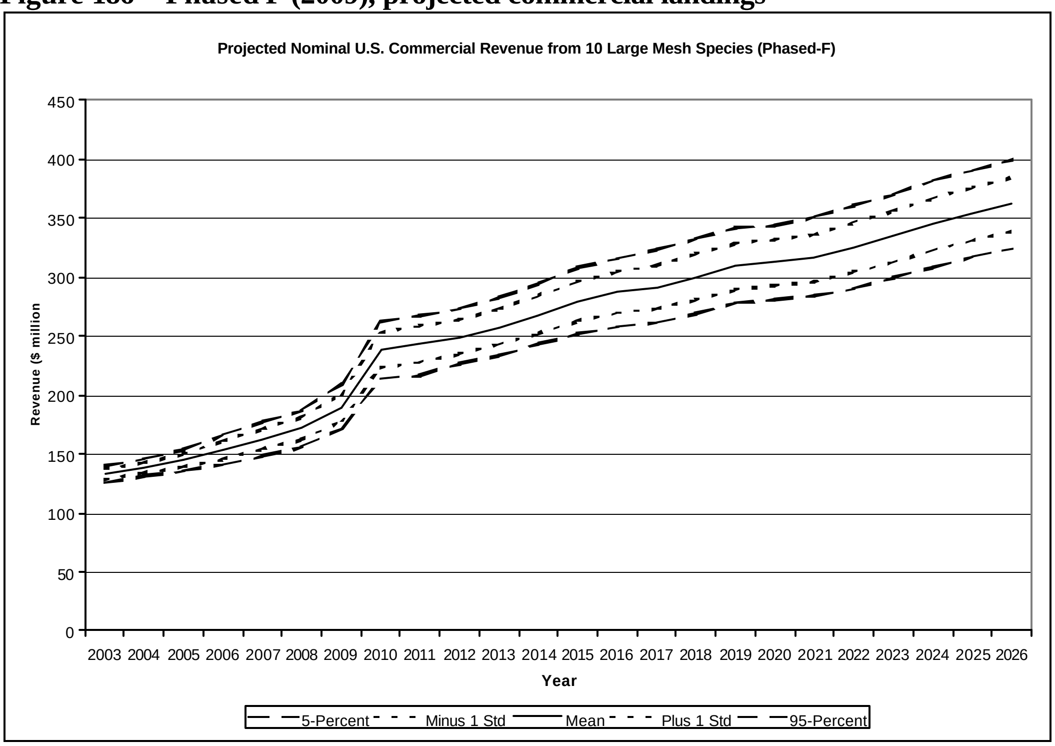


Figure 187 – Phased-F (2009), projected commercial revenues

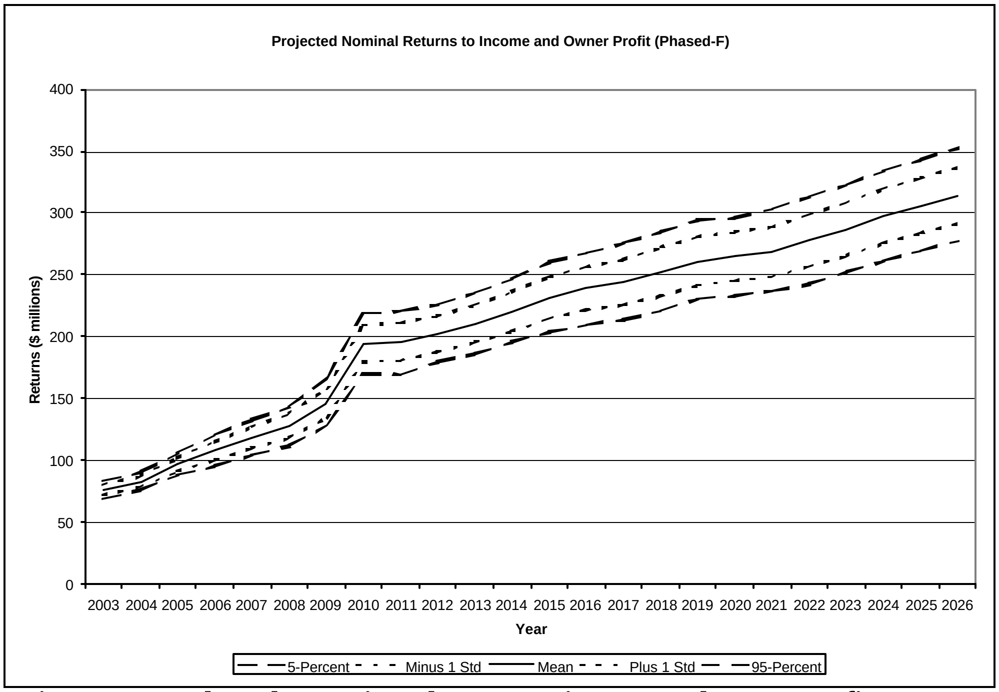


Figure 188 – Phased-F, projected return to income and owner profit

5.4.2.5 Comparison of Rebuilding Strategies for 2009 Rebuilding Time Frame for Most Stocks

While each rebuilding alternative achieves the same conservation objective for all stocks within the same time frame they do result in different time paths for landings and net benefit. To examine the performance of each alternative over time, all alternatives (including the Status Quo) are compared to No Action. In this context negative values indicate that a given rebuilding alternative would not yield higher landings or net benefit while positive values would indicate improvements in economic benefits relative to No Action.

With the exception of 2011 average landings for the Status Quo would not exceed No Action in any year other of the projection period although from 2007 onward the difference is relatively small (Figure 189). Both the Phased and Constant fishing mortality rebuilding strategies result in lower landings through 2009 but exceed No Action in every year thereafter. Compared to the Constant fishing mortality strategy, the Phased approach results in higher average landings 2004 to 2007, nearly equivalent landings from 2008 to 2011, but results in lower average landings from 2012 to 2026. Note that if the projection period were extended beyond 2026 the landings streams from both rebuilding strategies would be equivalent.

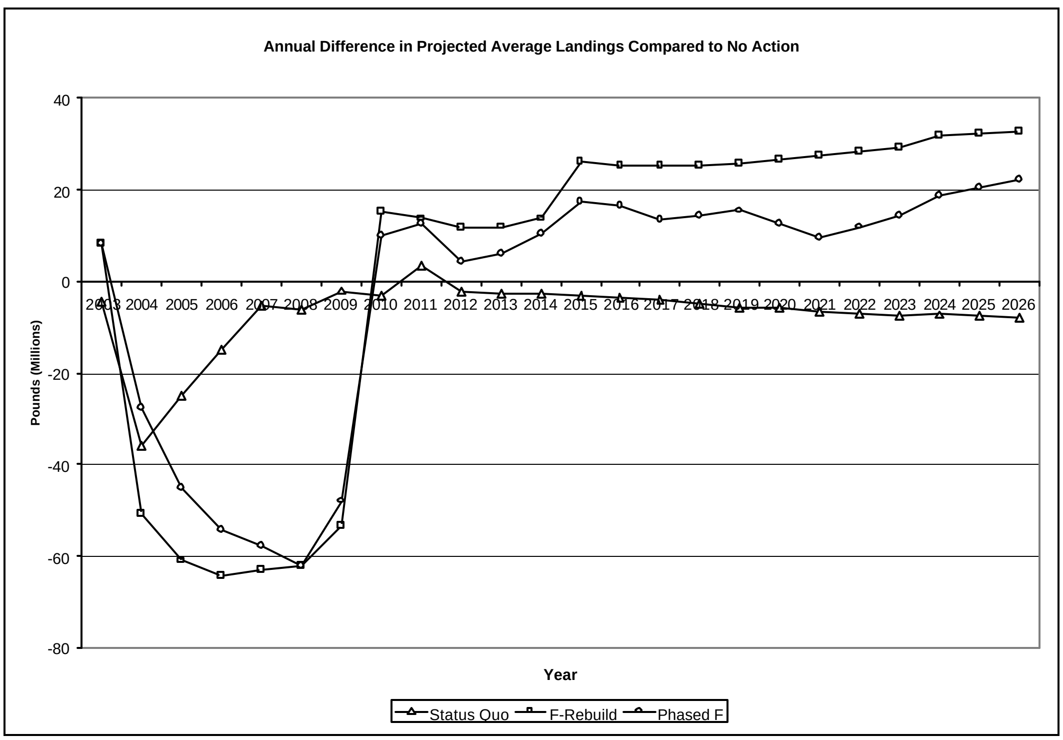


Figure 189 - Difference in projected landings (2009) for rebuilding strategies

Comparison of alternative benefit streams over time requires discounting future benefits to convert all benefit streams to a present value. For this purpose, a discount rate of 7% was selected as recommended by the Office of Management and Budget Circular A-94 and economic benefits were measured as the sum of consumer surplus, crew and captain payments, and vessel owner profit.

The Status Quo would not yield higher discounted net benefit than No Action in any year except 2011 (Figure 190). Neither rebuilding alternative would yield higher discounted net benefit in any year prior to 2010. However, as was the case for landings streams, both rebuilding alternatives would yield higher net benefit than No Action in 2010 and all subsequent years of the projection period and beyond. The relative pattern of average net benefit streams is similar to that of the landings streams with the Phased strategy yielding higher net benefit until 2008 but resulting in lower values of net benefit from 2010 to 2026.

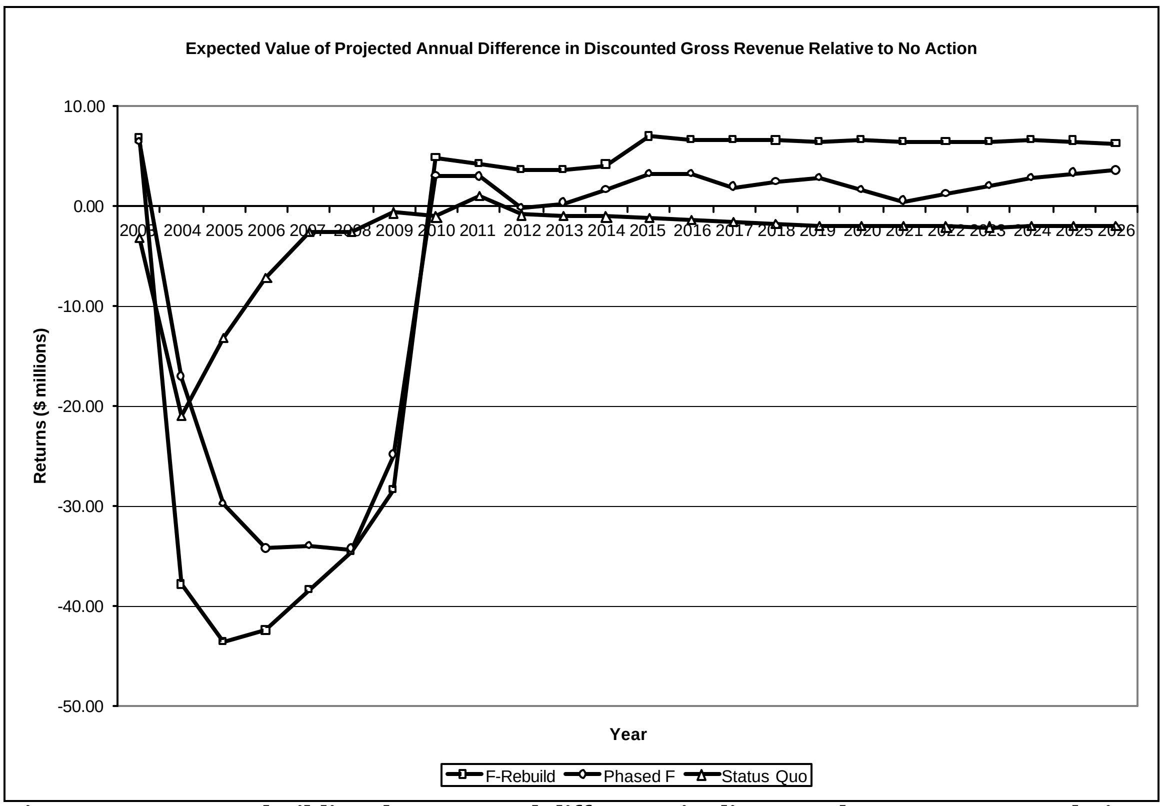


Figure 190 – 2009 rebuilding date - annual difference in discounted gross revenues relative to no action

Since both rebuilding alternatives result in net benefit streams that start out below that of No Action but end up well above No Action the year in which a benefit/cost ratio would exceed 1 (i.e. the present value of net benefit of rebuilding is greater than No Action) can be determined by examining the cumulative net benefit over time. Specifically, the Status Quo would not result in a benefit/cost ratio above 1 in any year of the projection period (Figure 191). The benefit/cost ratio would exceed 1 in 2022 for the Constant fishing mortality rate strategy and would exceed 1 in 2023 for the Phased rebuilding approach. Note that at lower discount rates the benefit/cost ratio would exceed 1 in an earlier year but would exceed 1 in later years at higher discount rates. The cumulative net benefit of the Phased rebuilding strategy is greater than the Constant fishing mortality rate alternative in every year until 2021. This means that the accumulated difference between these rebuilding alternatives over the first four years (2004 to 2007) takes thirteen years to overcome.

Over the entire rebuilding period the present value of net benefit is greatest for the Constant fishing mortality strategy at a discount rate of 7-percent. To test whether this ordinal ranking would be robust to the selected discount rates a range of discount rates from zero to 20-percent was evaluated. For all discount rates below 10-percent the present value of net benefit was positive for both rebuilding alternatives and the ordinal ranking of each alternative was consistent (Figure 192). However, at discount rates at 10-percent and above neither rebuilding alternative yielded positive present value (relative to No Action) and the ordinal ranking of the two alternatives was reversed.

As noted previously the projected landings streams, hence benefit streams, are subject to variability. Taking this variability into account means that there is some probability that any given alternative would result in higher net benefit than No Action after a specified time period. Compared to the Constant fishing mortality strategy (5-percent), the Phased rebuilding strategy would have a slightly higher probability (10-percent) of producing higher net benefit than No Action ten years after implementation (Figure 193). By contrast, the Status Quo would have a 30-percent chance of yielding higher net benefit than No Action. At the end of the rebuilding period the probability that the Status Quo would exceed No Action does not change, but the probability that either rebuilding alternative would produce higher present value of net benefit would increase to at least 70-percent.

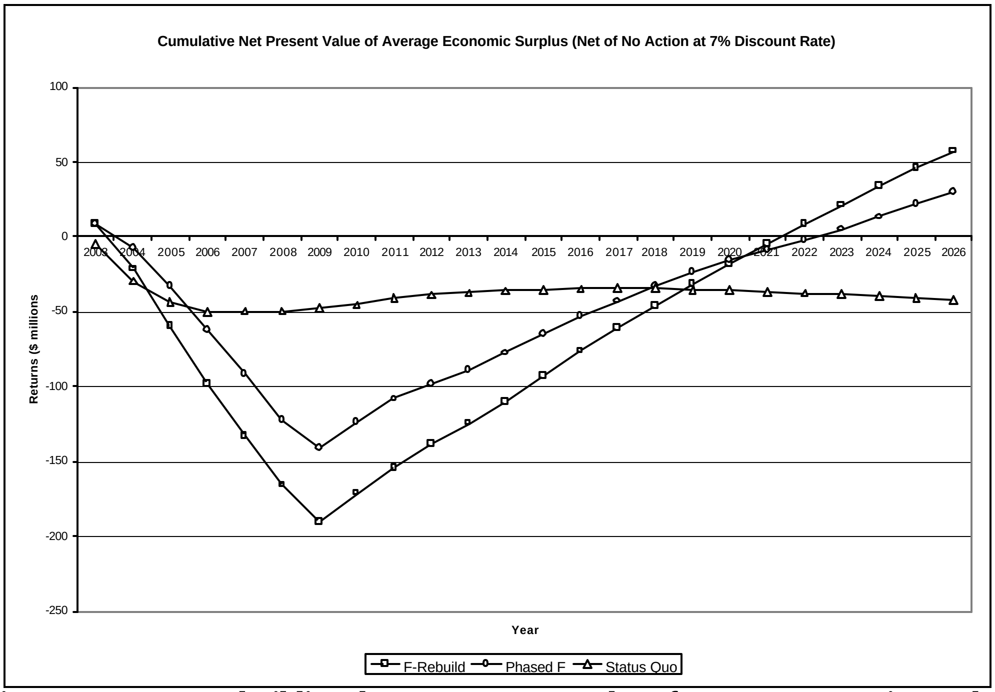


Figure 191 – 2009 rebuilding date – net present value of average economic surplus, net of no action

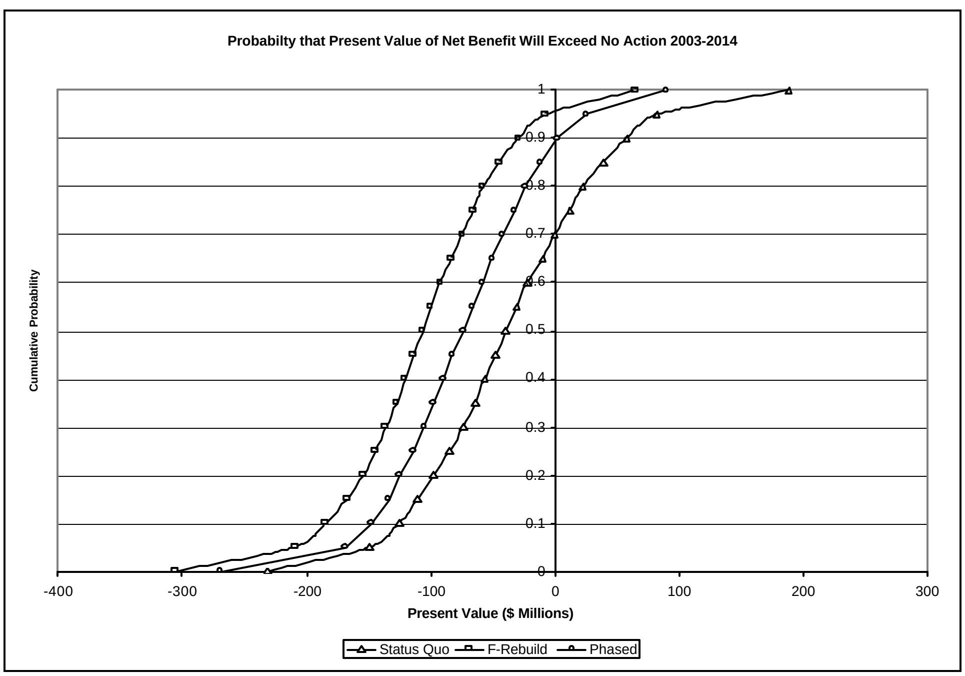


Figure 192 – 2009 rebuilding date – probability that present value of net benefit for different rebuilding programs will exceed no action, 2003 – 2014

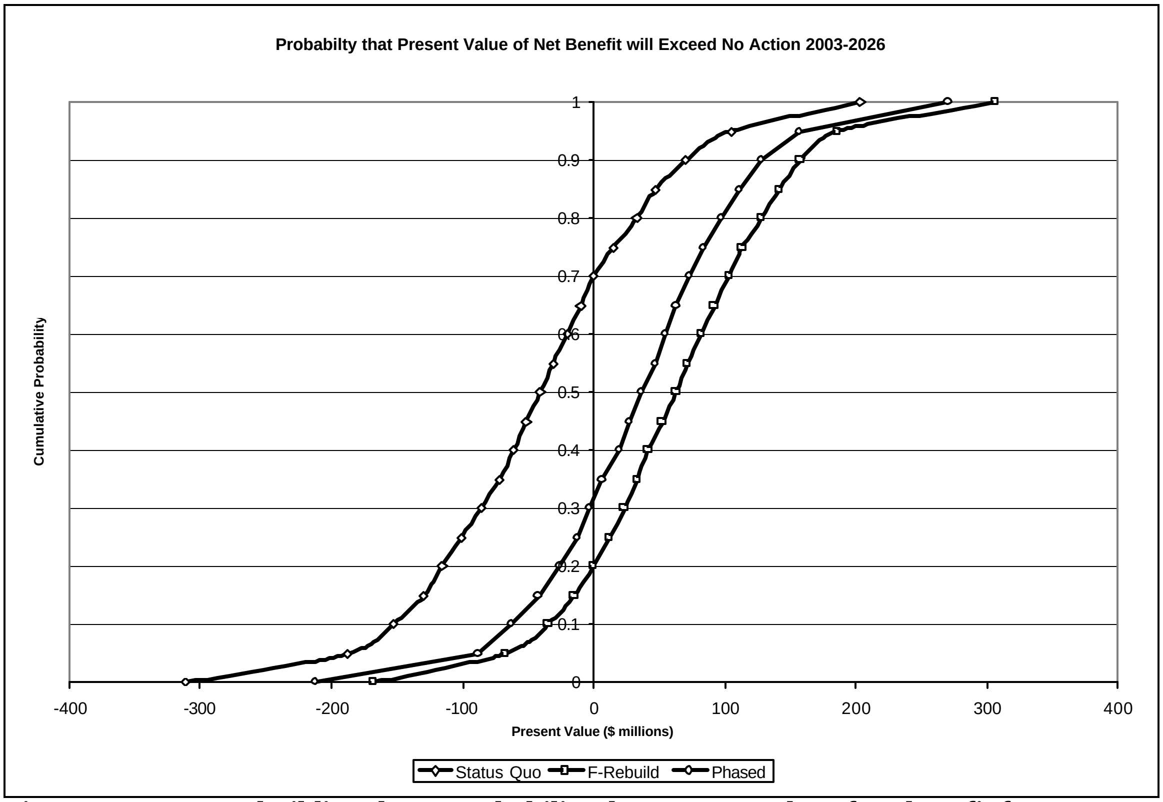


Figure 193 - 2009 rebuilding date – probability that present value of net benefit for different rebuilding programs will exceed no action, 2003 – 2026

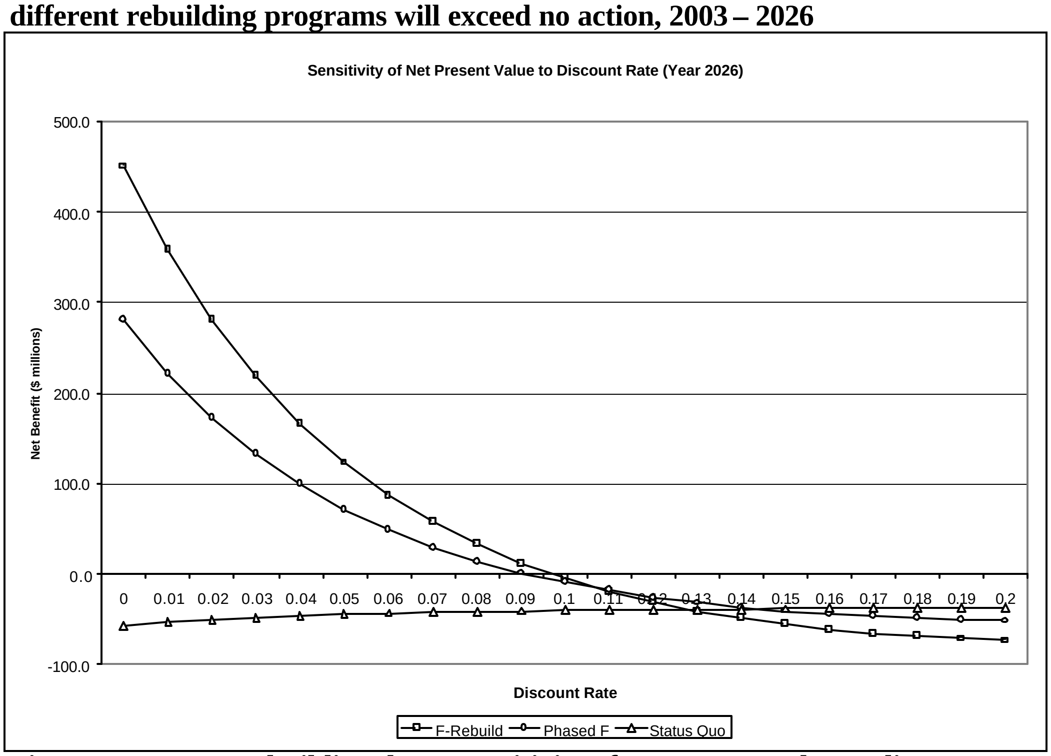


Figure 194 – 2009 rebuilding date – sensitivity of net present value to discount rate

5.4.2.6 Constant Fishing Mortality Rebuilding Strategy (2014)

Projected average landings under a constant fishing mortality strategy start out at 136 million pounds in 2003 but drop only slightly to 135 million pounds upon implementation of Amendment 13 in 2004 (Figure 195). This small reduction is due to the fact that the fishing mortality rates needed to achieve rebuilding in 2014 are higher than that needed to rebuild by 2009 so landings do not drop as much upon implementation. Compared to a mixture of 2009 and 2014 rebuilding times, projected landings exhibit only a single peak because nearly all stocks are on the same rebuilding time. After 2014 all stocks except for Cape Cod/Gulf of Maine yellowtail, Georges Bank Cod, and Acadian redfish are fished at MSY levels so from 2015 onward the projected landings under a 2014 rebuilding schedule are identical to a mixed 2009 and 2014 rebuilding time frame.

Average projected gross revenues follow the same general pattern as that of landings with nominal gross revenues in 2003 of $133 million falling $3 million in 2004 but rising to $375 million in 2026. Projected revenues bump up in 2015 as most stocks are fished a MSY levels but compared to the bump in landings, the magnitude of the bump is dampened by price reductions as market supplies increase. Note also that the revenues increase almost linearly with time even though landings increase at a slower rate. This effect is due to the time trend in the model used to predict prices, which results in a tendency for market prices to increase from one year to the next even though supplies may be relatively stable. This also means that projected revenues streams may be overly optimistic but since this relationship is embedded in all alternatives relative comparisons across alternatives are not likely to be significantly biased unless the time path is dramatically different.

Average returns to crew and captain incomes and vessel owner profit were projected to be $76 million in 2003 and increase to $83 million in 2004 (Figure 197). The increase in returns to labor and profit results because operating costs were projected to decline proportionally more (i.e. changes in operating costs are based on changes in fishing mortality rates; which decline under this alternative) than projected gross revenues. The net result is an increase in profit and income payments even though both landings and gross revenues decline.

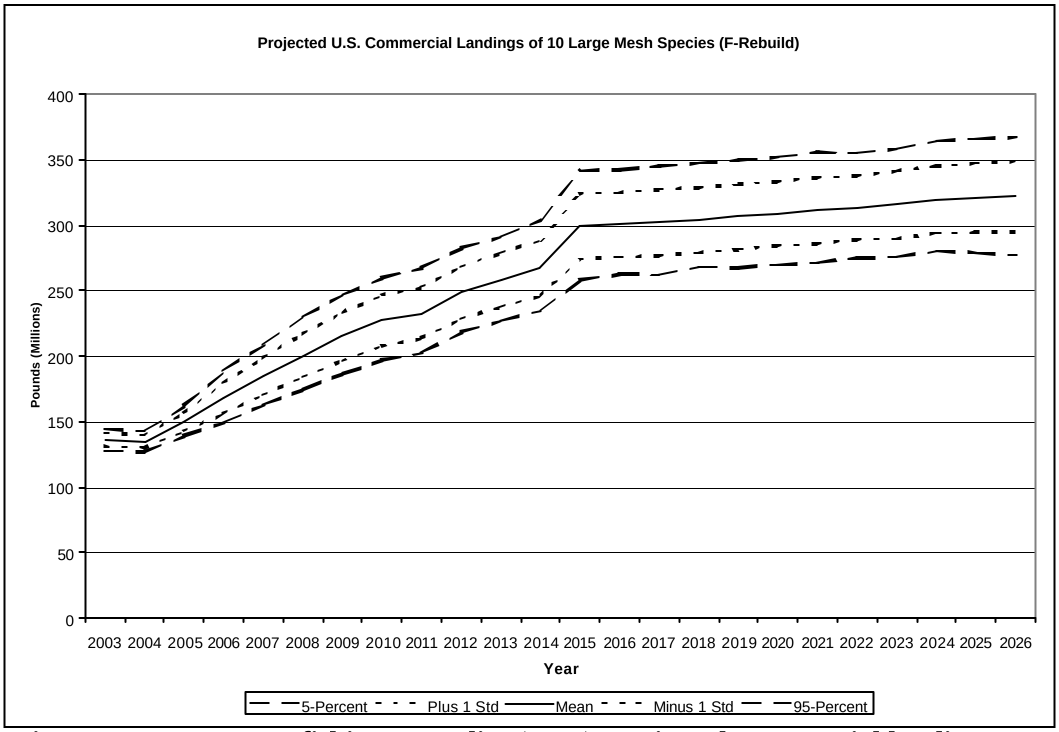


Figure 195 – Constant fishing mortality (2014), projected commercial landings

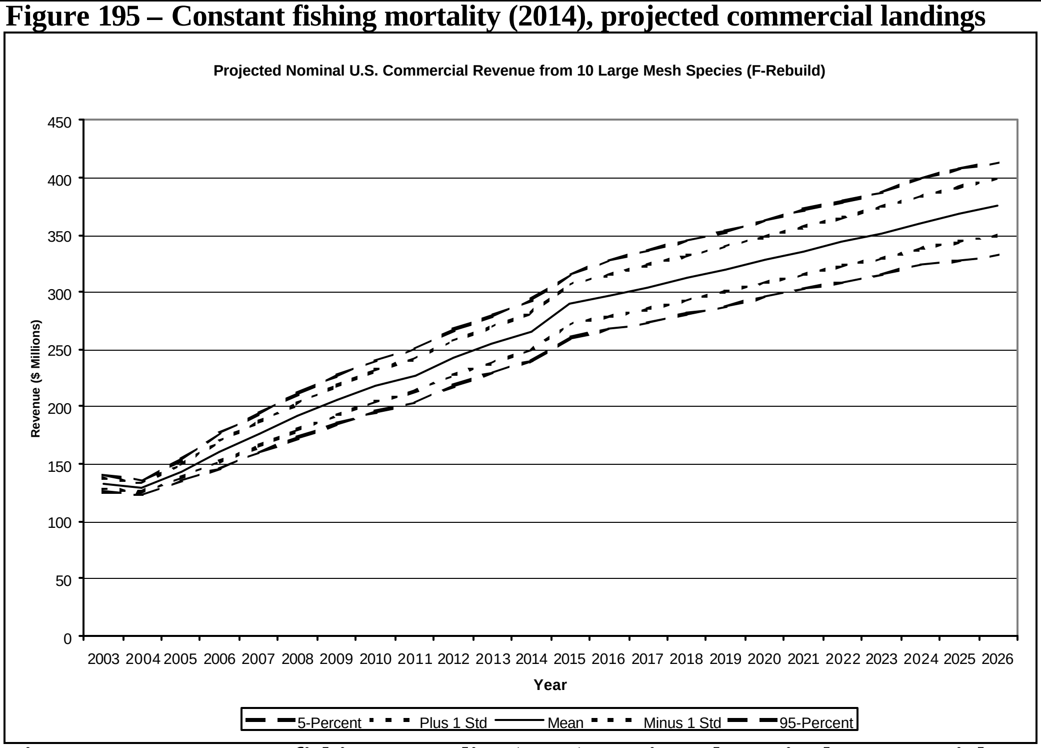


Figure 196 – Constant fishing mortality (2014), projected nominal commercial revenues

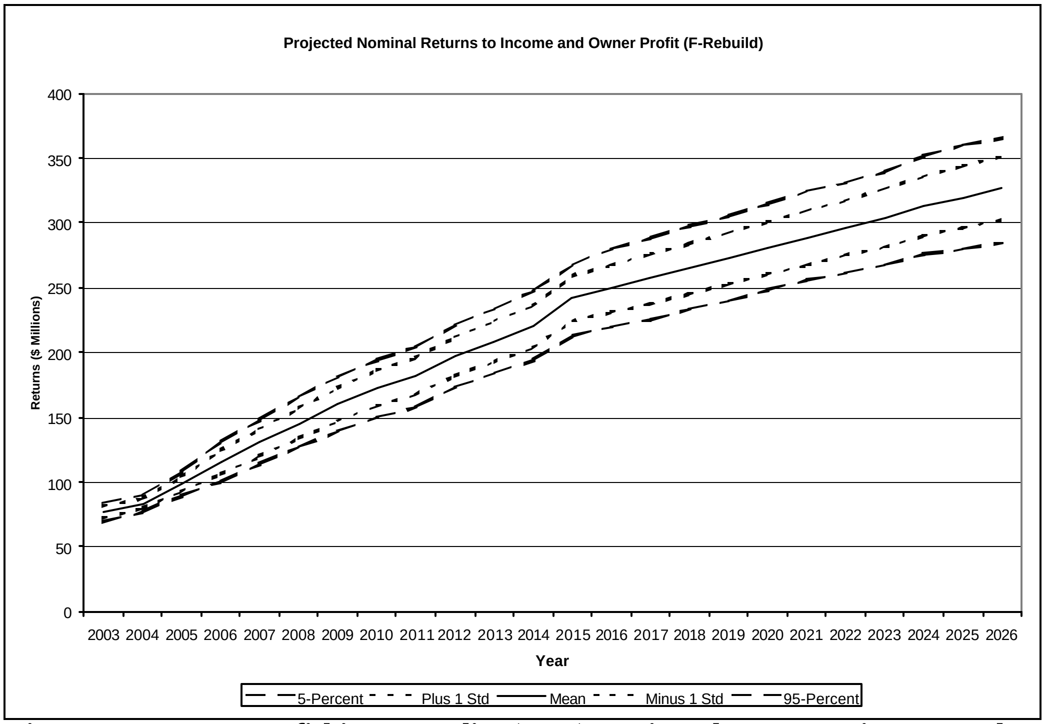


Figure 197 – Constant fishing mortality (2014), projected returns to income and owner profit

5.4.2.7 Phased Fishing Mortality Rebuilding Strategy (2014)

Average commercial U.S. landings of large mesh groundfish species were projected to be 136 million pounds in 2003 and increase to 152 million pounds in 2004 (Figure 198). Compared to the Constant fishing mortality strategy landings increase from 2003 to 2004 because the phased reduction schedule would actually result in increases in fishing mortality rates for a few stocks, but only within the first year of implementation. Compared to the Constant fishing mortality rate strategy the Phased rebuilding approach would result in higher landings until 2008 but would result in lower landings from 2009 onward until the end of the projection period.

Projected revenue streams for the Phased rebuilding strategy were $133 million in 2003 and increase to $146 million in 2004 (Figure 199). As was the case for landings, the revenue streams for the phased approach exceed that of the Constant fishing mortality strategy until 2009. From 2009 onward the Constant fishing mortality approach yields higher nominal revenues through 2026. Note, however that the 95-percent confidence intervals around the average revenue streams for both rebuilding approaches overlap which means that the two revenues from either alternative are virtually indistinguishable from one another.

Average returns to crew and captain incomes and vessel owner profit follow the same general pattern as that of projected revenues. Returns to income and profit were estimated to be $76 million in 2003 and $92 million in 2004 (Figure 200). As noted above, the confidence intervals for the Phased and Constant fishing mortality approaches overlap, but the distinguishing feature of the Phased approach is that neither revenues nor income payments go down in any year of the rebuilding period.

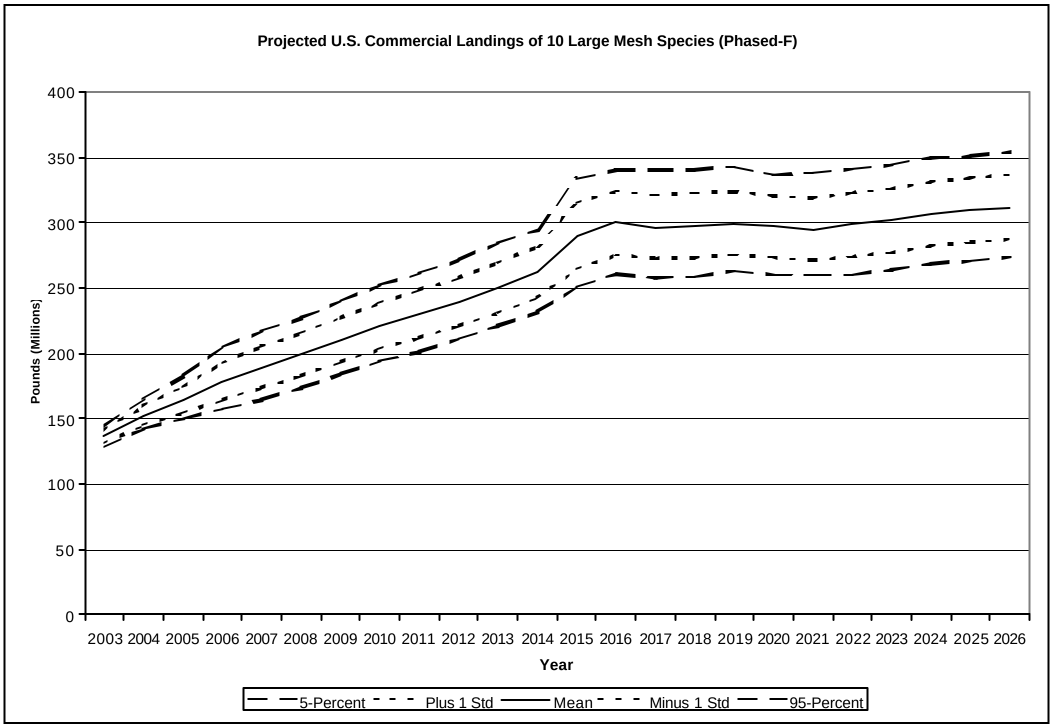


Figure 198 – Phased fishing mortality (2014), projected commercial landings

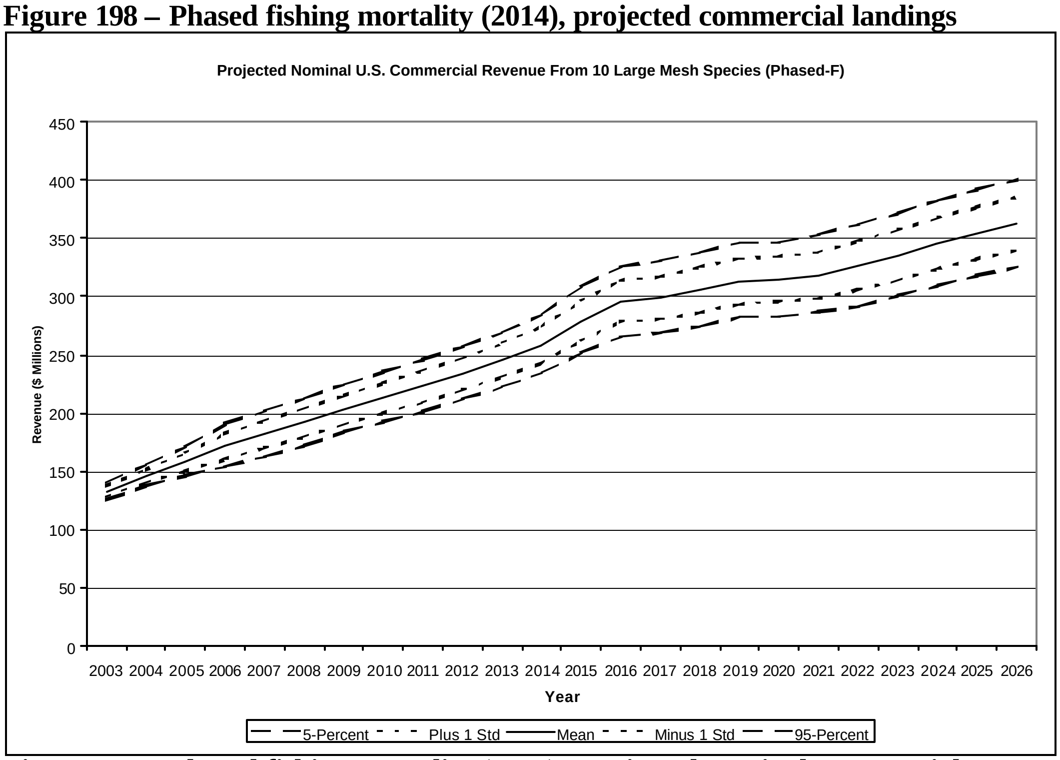


Figure 199 – Phased fishing mortality (2014), projected nominal commercial revenue

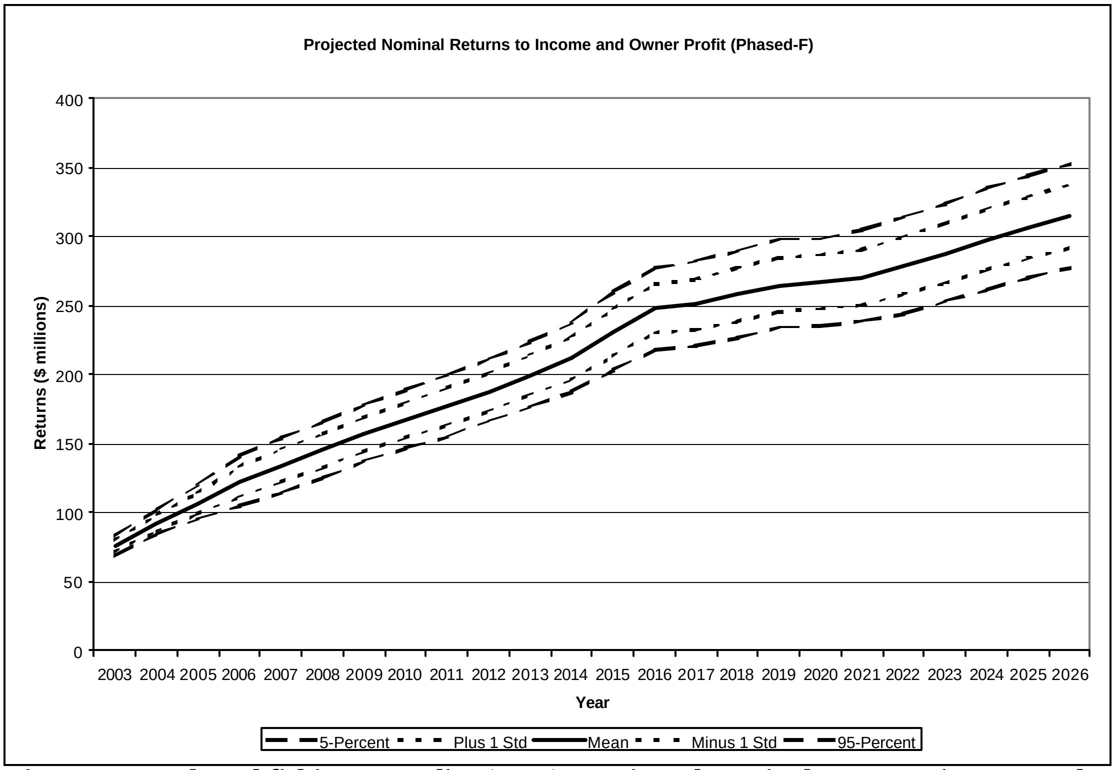


Figure 200 – Phased fishing mortality (2014), projected nominal return to income and owner profit

5.4.2.8 Adaptive Management Rebuilding Strategy (2014)

The landings streams under the Adaptive strategy represent one of many possibilities that could be realized pending the scheduled 2008 review of progress toward rebuilding. The particular projected landings represent the scenario where the management program is determined to meet all Fmsy targets and all biomass reference points remain unchanged. Under this scenario management measures would be implemented in 2009 to achieve constant fishing mortality rates from 2009 until the end of the 2014 rebuilding period. Average landings under this scenario increase slightly from 136 million pounds to 139 million pounds in 2004. (Figure 201). Projected landings increase in each subsequent year through 2008 but decline (about 4 million pounds) in 2009 with implementation of rebuilding fishing mortality rates where required. Note that this reduction in landings is recovered within one year as average 2010 landings were approximately 10 million pounds greater than 2008.

Average projected revenues follow a pattern similar to that of landings with the exception that the reduction in revenues is dampened by changes in predicted prices such that average revenues do not decline from 2008 to 2009 (Figure 202). As noted previously, the 95% confidence intervals around the mean revenues stream overlap for all rebuilding alternatives. This means that the average revenue stream could be obtained under any of the rebuilding alternatives.

Projected nominal returns to captain and crew income and vessel owner profit averaged $76 million in 2003 and $85 million in 2004 (Figure 203). Projected returns follow a pattern similar to that of the revenues streams except that the change in income and profit is slightly greater ($6 million) than the revenue change ($4 million). This difference is due to a reduction in operating costs that accompany the reduction in effort that is required in 2009 to meet all rebuilding targets within the 2014 rebuilding time.

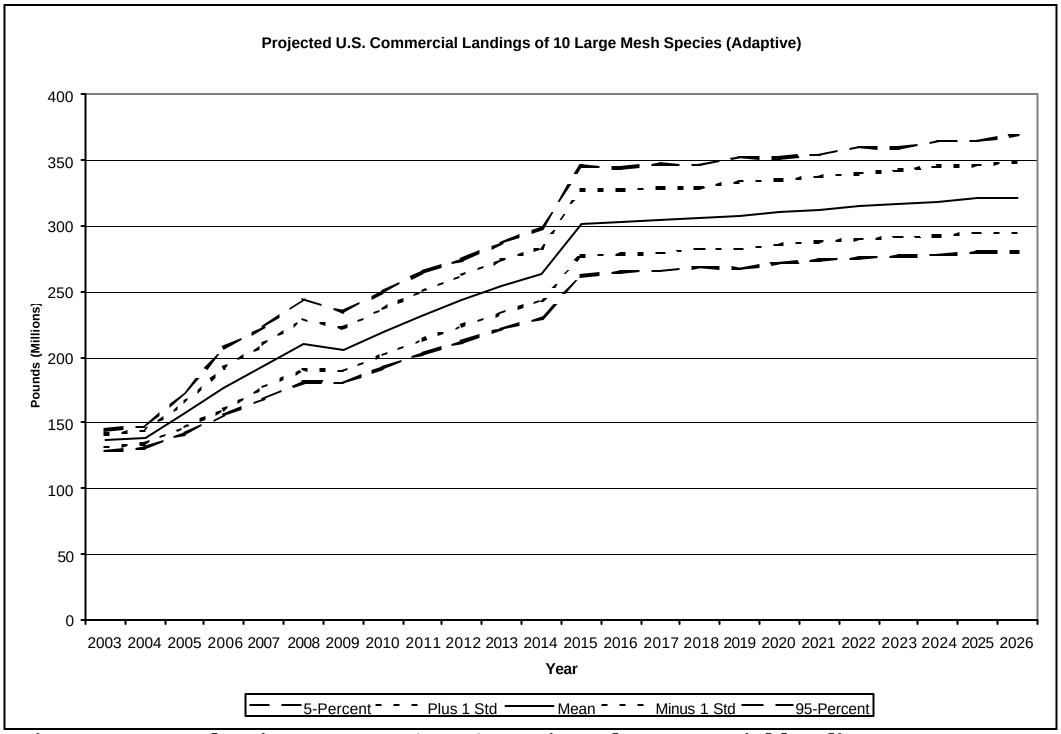


Figure 201 – Adaptive strategy (2014), projected commercial landings

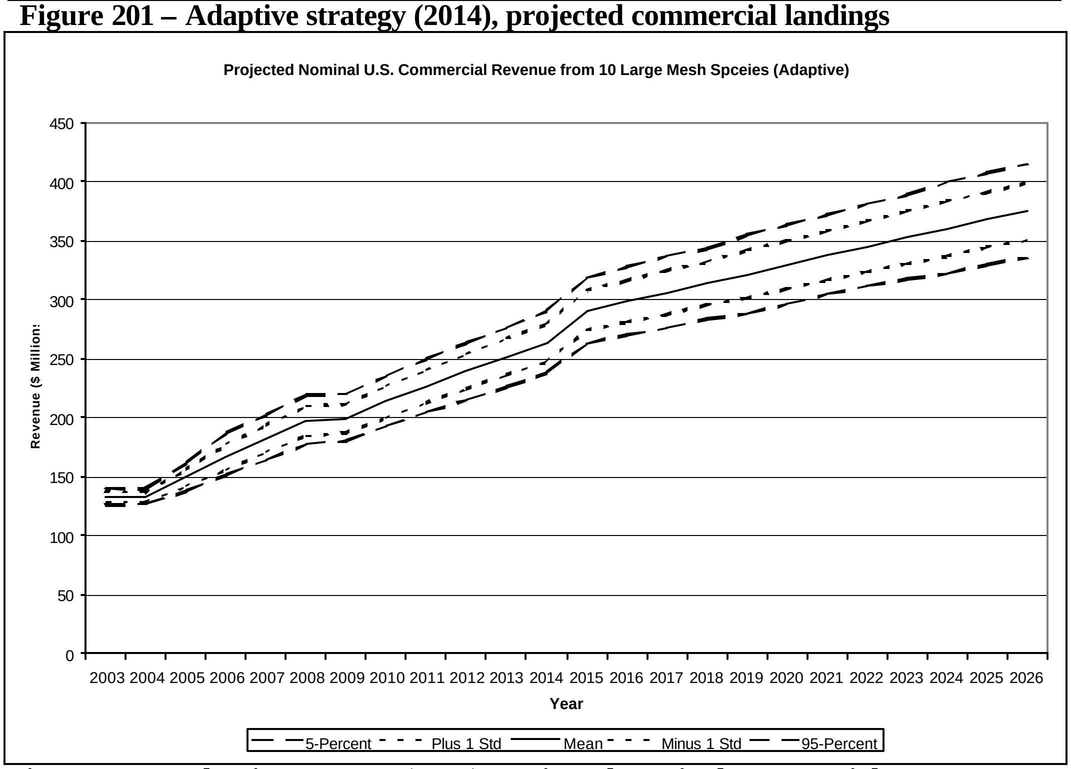


Figure 202 – Adaptive strategy (2014), projected nominal commercial revenues

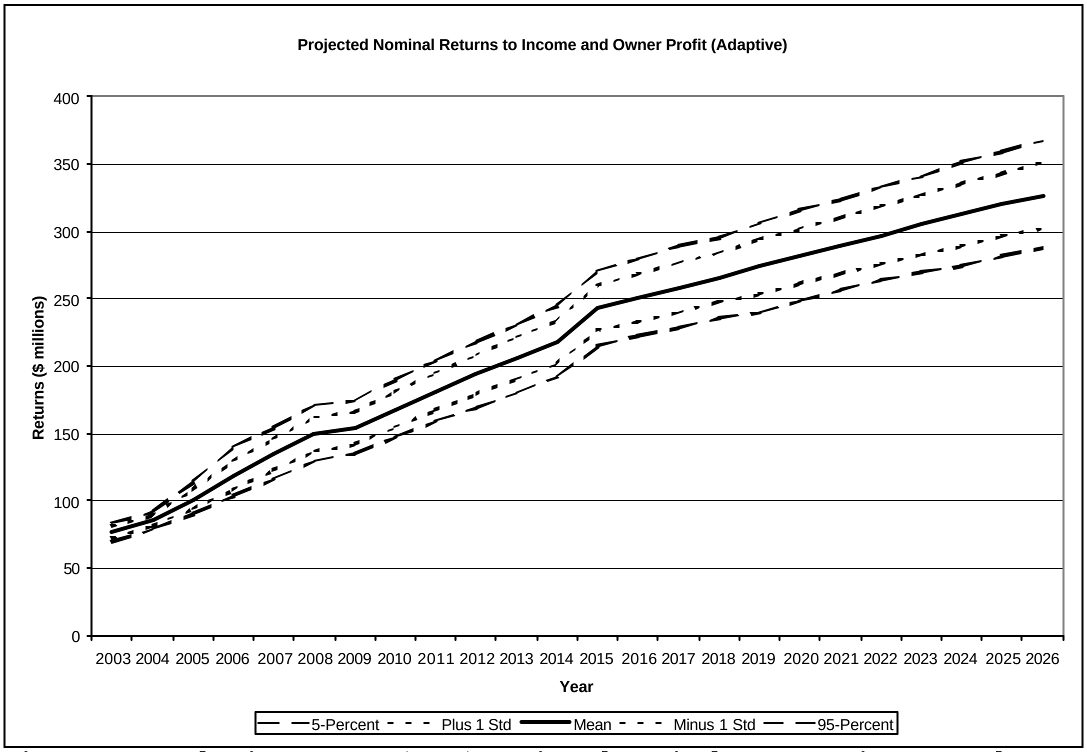


Figure 203 – Adaptive strategy (2014), projected nominal returns to income and owner profit

5.4.2.9 Comparison of Rebuilding Strategies for 2014 Rebuilding Time Frame for Most Stocks

Each rebuilding alternative results in the same conservation outcome in 2014 for most stocks and by 2026 for Georges Bank cod and Cape Cod/Gulf of Maine yellowtail flounder but they do so by achieving different fishing mortality rates over time. Figure 204 shows recent calendar year landings of regulated groundfish species and the projected landings under different rebuilding options.

In the draft amendment, the economic impacts of rebuilding strategies were estimated assuming perfect implementation – that is, all mortality rates were assumed to be precisely achieved. The projected landings streams from these analyses represent the yield that could be produced if all fishing mortality rates appropriate to each stock were exactly achieved in each year. As such, these landings streams may not reflect realized yield, since realized fishing mortality rates will be sensitive to the specific management measures to be implemented. While estimates of realized fishing mortality rates have been developed, these forecasts are likely to be valid only over the very short term, leaving considerable uncertainty over the longer-term performance of any given rebuilding strategy. Substituting allowable fishing mortality rates for "realized" fishing mortality rates sharpens the focus of analysis on the fundamental difference among alternative rebuilding strategies which is the magnitude and timing of fishing mortality rate changes over time. The cost of doing so is that a meaningful link between estimates of realized short-term impacts and projected landings streams is difficult to establish. This was one of the criticisms of the analyses raised during the public comment period. The benefit of doing so is that all projections are internally consistent with one another and comparisons across alternatives and over time are also valid.

Analysis of the proposed action, while using the same analytic techniques, has a key difference. The rebuilding strategies in the draft amendment were theoretical constructs; management measures were then developed that tried to meet the target fishing mortality rates. In some cases the proposed measures did so imperfectly. The proposed action, however, has a much closer link between the measures and the rebuilding fishing mortality rate schedule. For healthy stocks, the estimates assume that the special access programs and other measures in the plan will allow harvesting to the appropriate fishing mortality rate. For stocks in poor condition, the proposed combined rebuilding strategy mortality rates are closely linked to the expected impacts of the proposed management measures. Thus, the estimated impacts should more accurately reflect the realized landings and revenues from the proposed action. This approach addresses to some extent the criticism that the draft amendment did not accurately reflect revenues that could be expected as a result of the management program. It also narrows the perceived difference between the short and long term analyses of the proposed action.

The fact that projected landings streams represent somewhat idealized conditions complicates interpretation of Figure 204 at least over the short term. While the projected landings in 2004 indicate an increase in landings, the management measures may prevent these projected levels from being realized. Nevertheless, the longer term projections indicate that rebuilding the groundfish resource would ultimately result in levels of landings more than four times as great as the 75 million pounds experienced from 1994 to 1999 and would be three times that landed in 2001, the highest recorded landings since 1993.

Average performance of each of these rebuilding alternatives is measured against No Action by subtracting the No Action projection from the rebuilding projection (the Status Quo included). In this manner, a negative value means that No Action produces higher yield while a positive value means that

No Action produces lower yield than a given rebuilding alternative. Note that No Action only serves as a common benchmark against which all rebuilding alternatives may be compared; not as a rebuilding alternative itself.

The Status Quo produces lower landings than No Action in every year except 2011 (Figure 204). Every rebuilding alternative produced lower projected landings from 2004 to 2013. Only the Constant fishing mortality alternative produces higher landings than No Action in 2014. All rebuilding alternatives result in higher projected landings in all years from 2015 onward. Specifically, projected landings would be more than twice (119%) what the 2003 projected level and would be 136% higher than 2003 levels in 2026.

Across rebuilding alternatives, the Proposed Action produces higher landings in each year from 2004 through 2007 and produces second highest yield in 2008. Over these years the Proposed Action benefits from the higher fishing mortality rates under the early years of both the phased and the adaptive approach. However, from 2010 to 2014 the fishing mortality rates under the Proposed Action must be lower than under any other alternative to make up for the higher rates of the first four years. From 2015 onward the Proposed Action landings follow a pattern similar to the Adaptive and the Constant fishing mortality rate strategies since all stocks except Cape Cod Yellowtail Flounder will be fished at approximately the same level.

The range of the difference between No Action revenue streams (Figure 205) and any rebuilding alternative is somewhat less than that of the landings streams (plus 35 million or minus 45 million pounds). Further note that the gap in projected revenues between any given rebuilding alternative is even narrower, which means that the time path for revenues streams is not substantially different across rebuilding alternatives. Across rebuilding alternatives the largest difference in projected revenues occurs within the first four years of the rebuilding time where the Proposed Action results in roughly equivalent or slightly higher revenue streams from 2004 to 2008. As noted above, the Proposed Action produces lowest revenue streams in every year from 2009 to 2014. From 2015 onward, the Proposed Action, Adaptive, and Constant F approaches all produce nearly identical revenues.

The cumulative annual difference in present value of net benefit (consumers surplus plus income and profit) between No Action and any give alternative indicates in which year a benefit/cost ratio (relative to No Action) would be greater than one (Figure 206). The cumulative difference in net present value for the Status Quo is not positive for any year of the projection period suggesting that the Status Quo would never producer higher economic benefit than No Action (Figure 207). At a 7-Percent discount rate the Adaptive approach would yield positive present value of economic benefit in fourteen years (2018) while the Proposed Action and the Constant fishing mortality strategy would produce positive economic benefit net, of No Action, in fifteen years (2019). Relative to No Action, the pure Phased approach would yield positive present value of economic benefit in sixteen years (2020). At lower discount rates, the number of years to reach positive cumulative present value would be lower but the ordinal ranking across alternatives would not change.

The sensitivity of the ordinal ranking across rebuilding alternatives was examined by selecting discount rates from zero to twenty-percent (Figure 208). Over the entire rebuilding period the ordinal ranking of all alternatives was robust for all discount rates up to seven percent. At discount rates above seven, the Proposed Action would produce lowest net present value among all alternatives except for the Status Quo. All alternatives would at least produce positive net benefits net of No Action at any discount rate up to and including ten-percent. At higher discount rates benefits net of No Action would be less than zero (eleven-percent for the Proposed Action; twelve-percent for the pure phased approach; fourteen-percent for Constant fishing mortality; and fifteen-percent for the Adaptive approach).

Projected landings streams, hence estimates of present value of net benefit are subject to uncertainty. Taking the full range of simulated realizations into account, the probability that the present value of net benefit will exceed No Action from 2003 to 2014 is approximately fifteen-percent for the Adaptive, pure Phased, and Constant fishing mortality rate strategies but is only about five-percent for the Proposed Action (Figure 209). Conversely, there is an Eighty-five-percent chance that No Action would produce higher present value of net benefit than any one of the three rebuilding alternatives.

Over the entire rebuilding period (2003 to 2026) there is at least an eighty-percent probability that any one of the rebuilding alternatives would yield higher present value of net benefit than No Action (Figure 210). Unlike the shorter time period, the cumulative probability distributions across all rebuilding alternatives do not overlap. Specifically, the cumulative probability distribution for the Adaptive approach lies everywhere rightward of all other alternatives. This means that for any given value of economic benefit net of No Action the Adaptive approach has the highest probability of being larger than No Action. By contrast, the Phased approach would have the lowest probability of being greater than No Action for any given value of present value of net benefit. The probability that the Proposed Action would be greater than No Action was estimated to be only slightly less than 80% and would be nearly equivalent to that of the pure Phased approach.

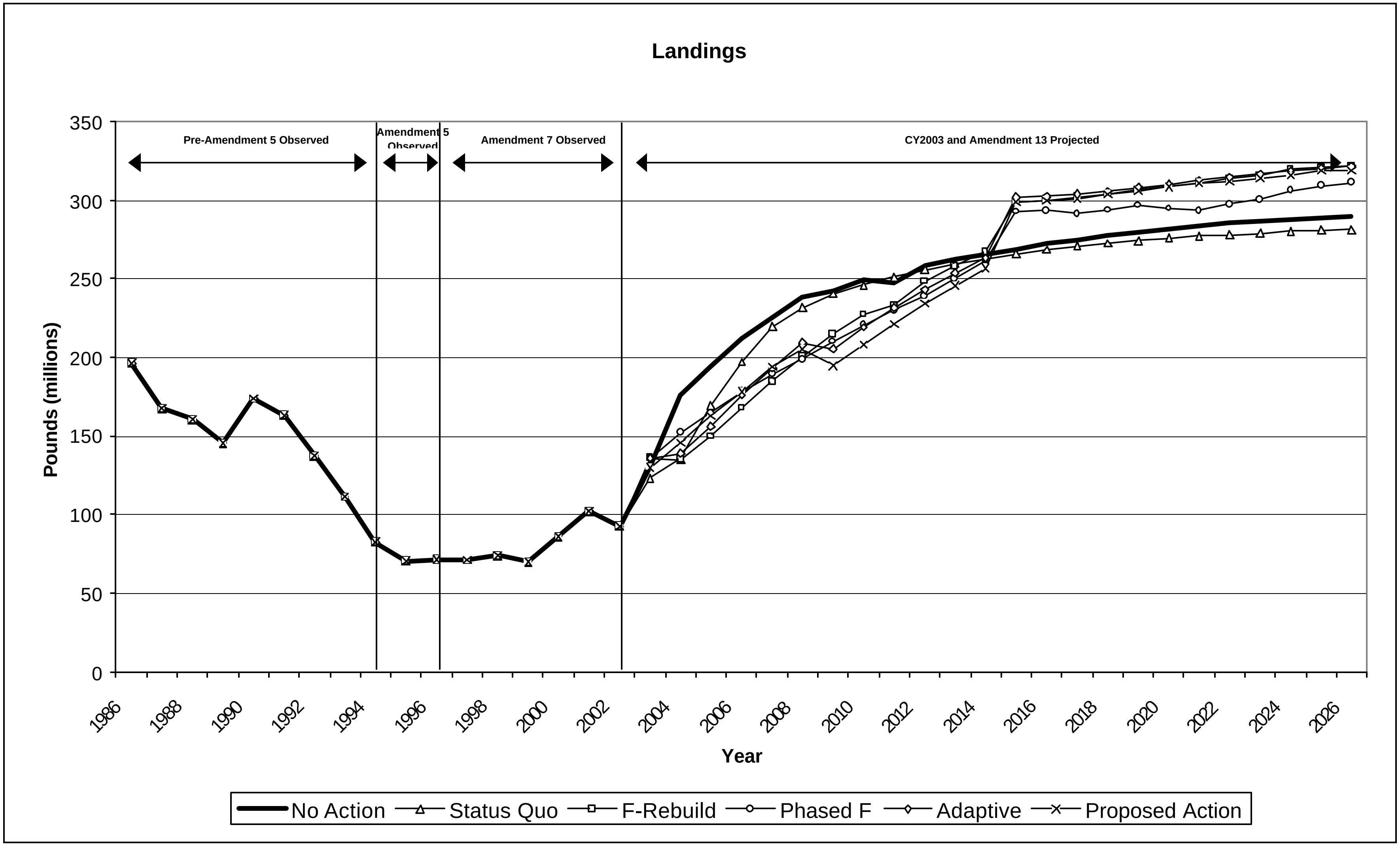


Figure 204 – Historic and projected landings of ten regulated groundfish (under alternative rebuilding strategies, 2014 ending date for most stocks)

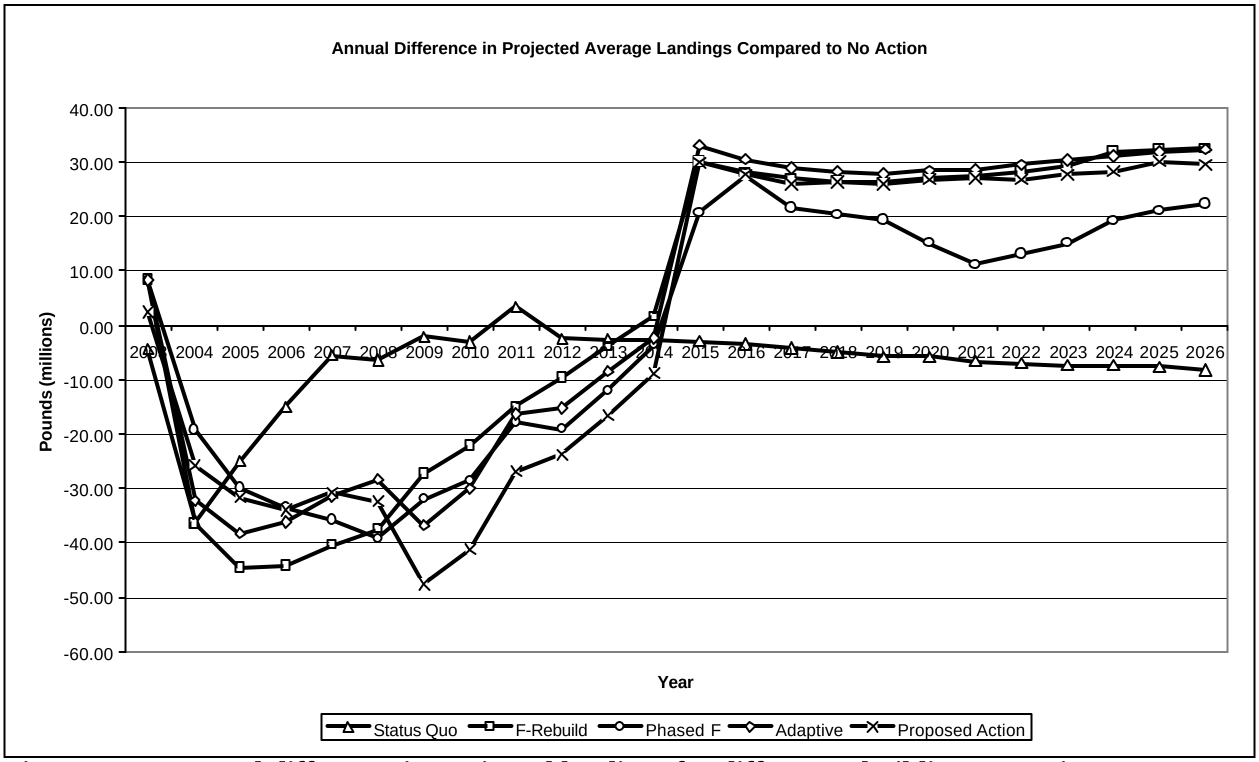


Figure 205 – Annual difference in projected landings for different rebuilding strategies

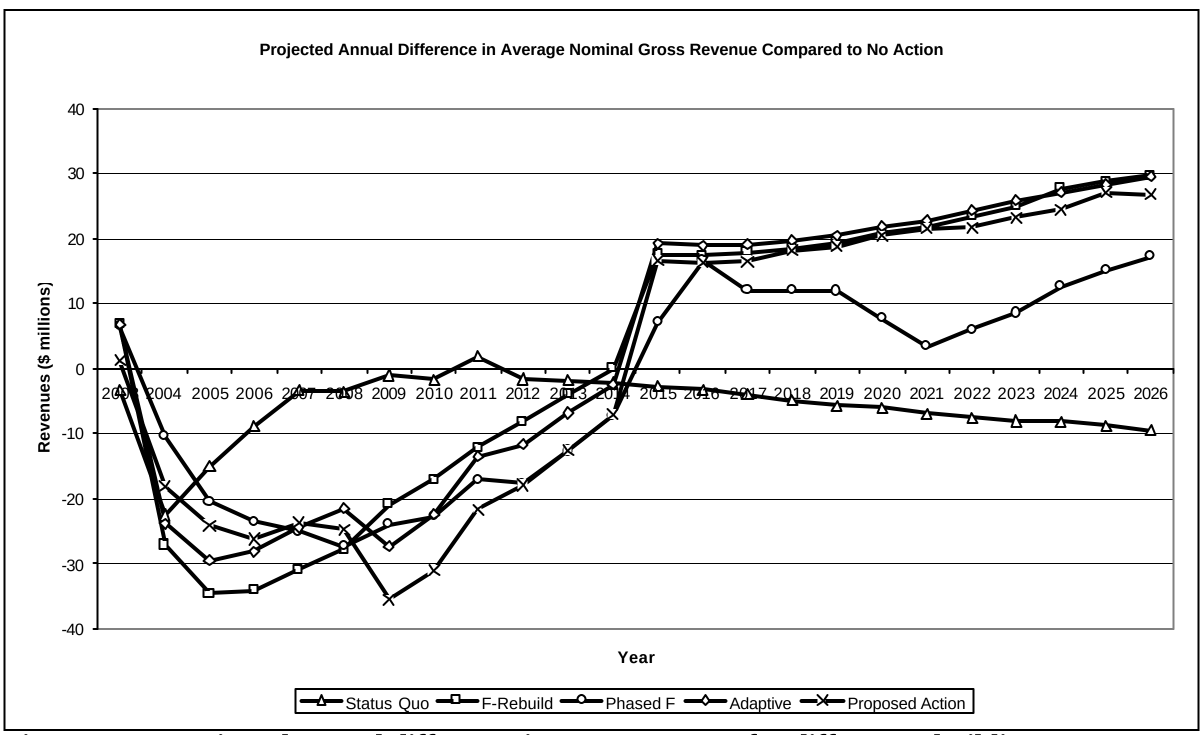


Figure 206 – Projected annual difference in gross revenues for different rebuilding Strategies

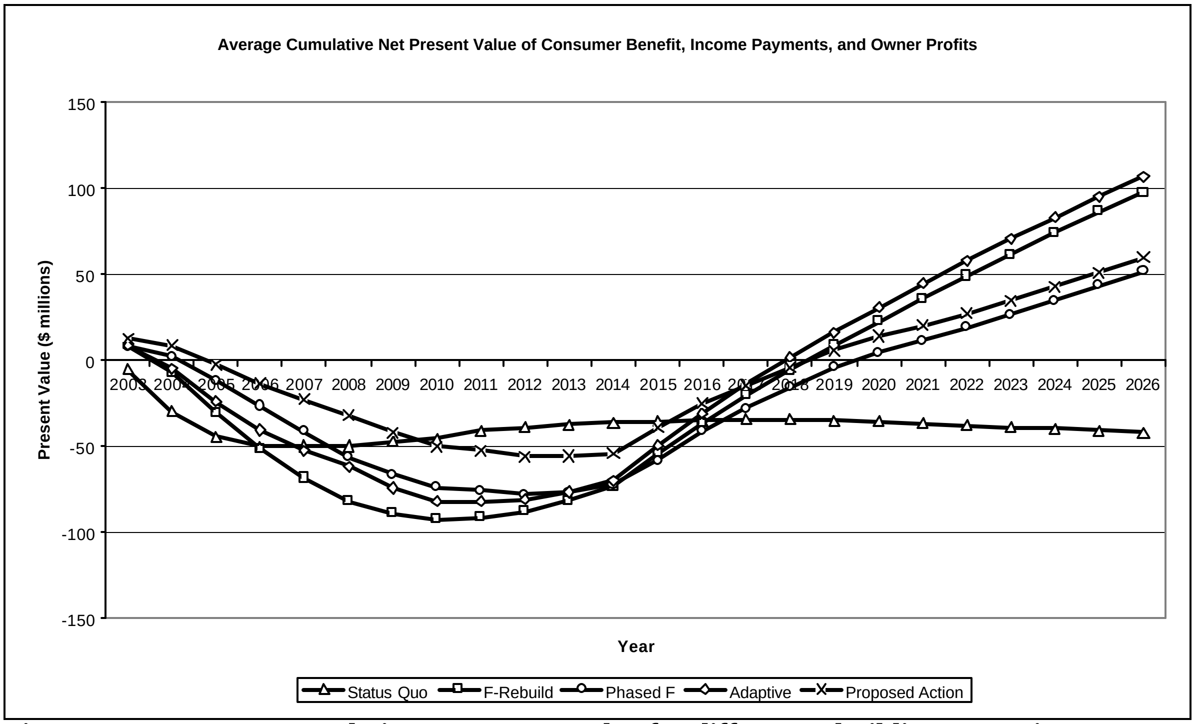


Figure 207 – Average cumulative net present value for different rebuilding strategies

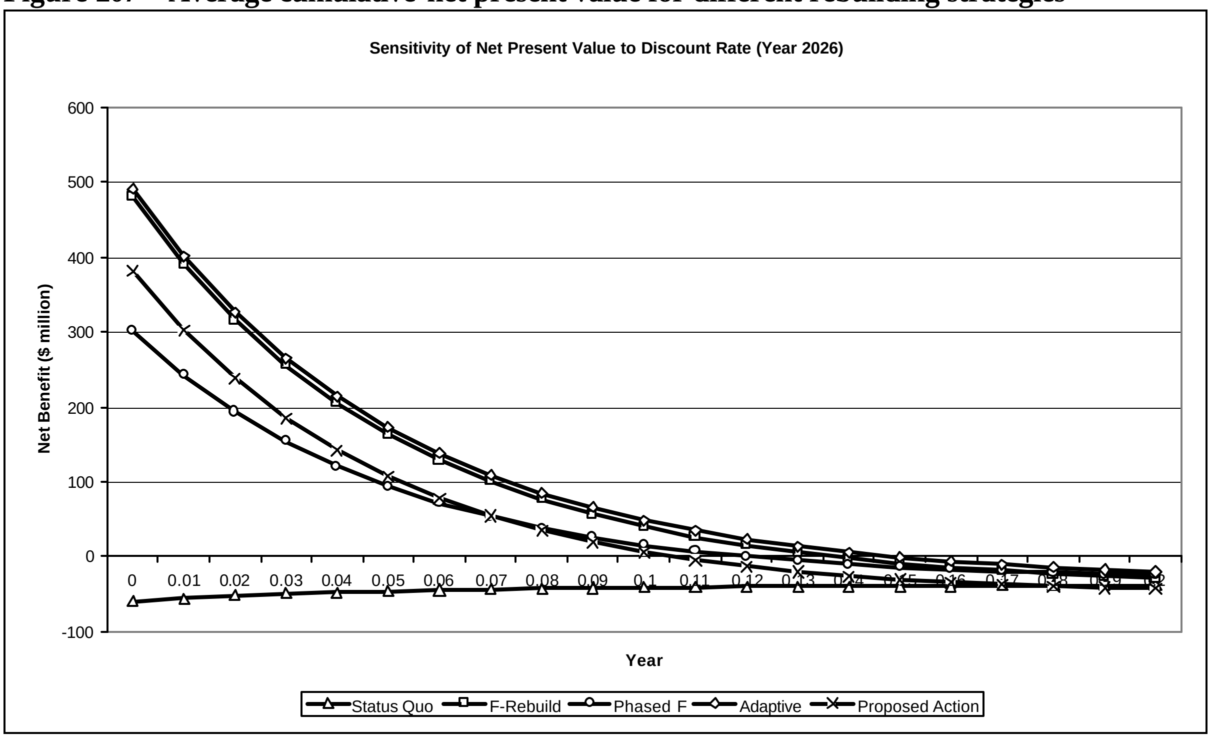


Figure 208 – Sensitivity of net present value to discount rate for different rebuilding strategies

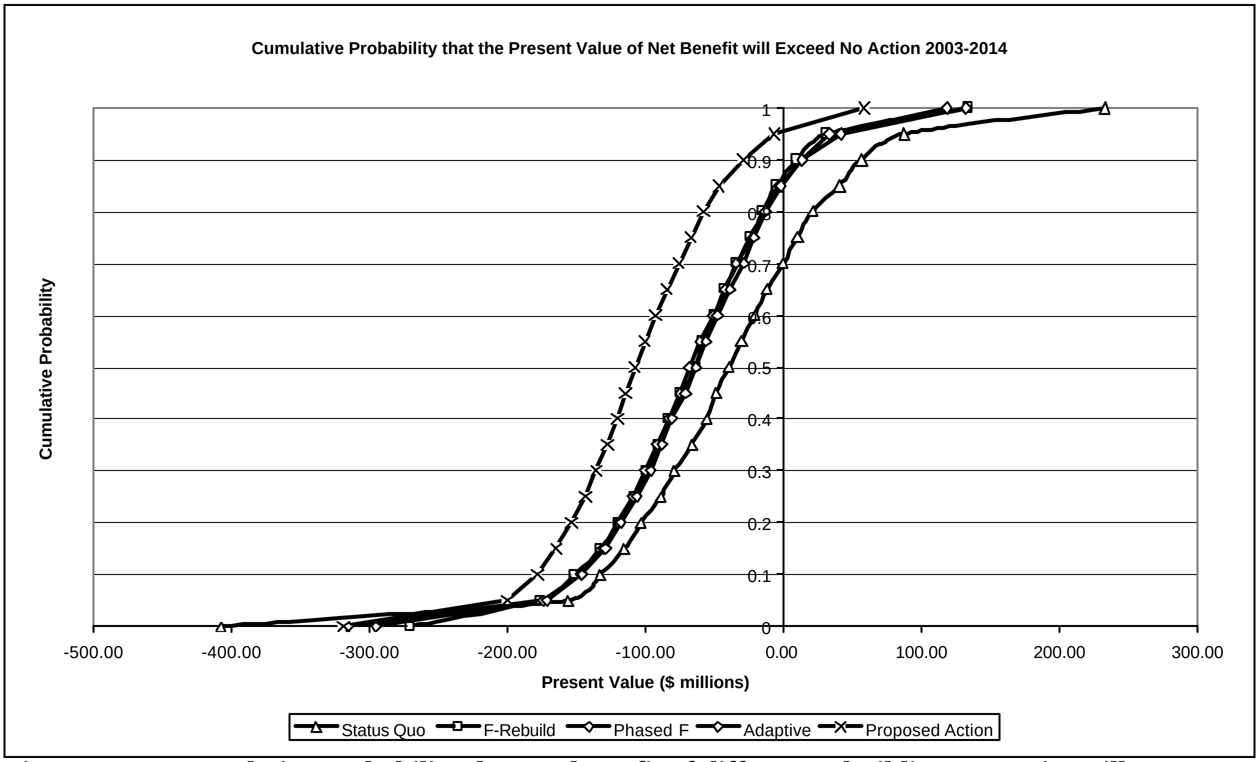


Figure 209 – Cumulative probability that net benefit of different rebuilding strategies will exceed no action (2003-2014)

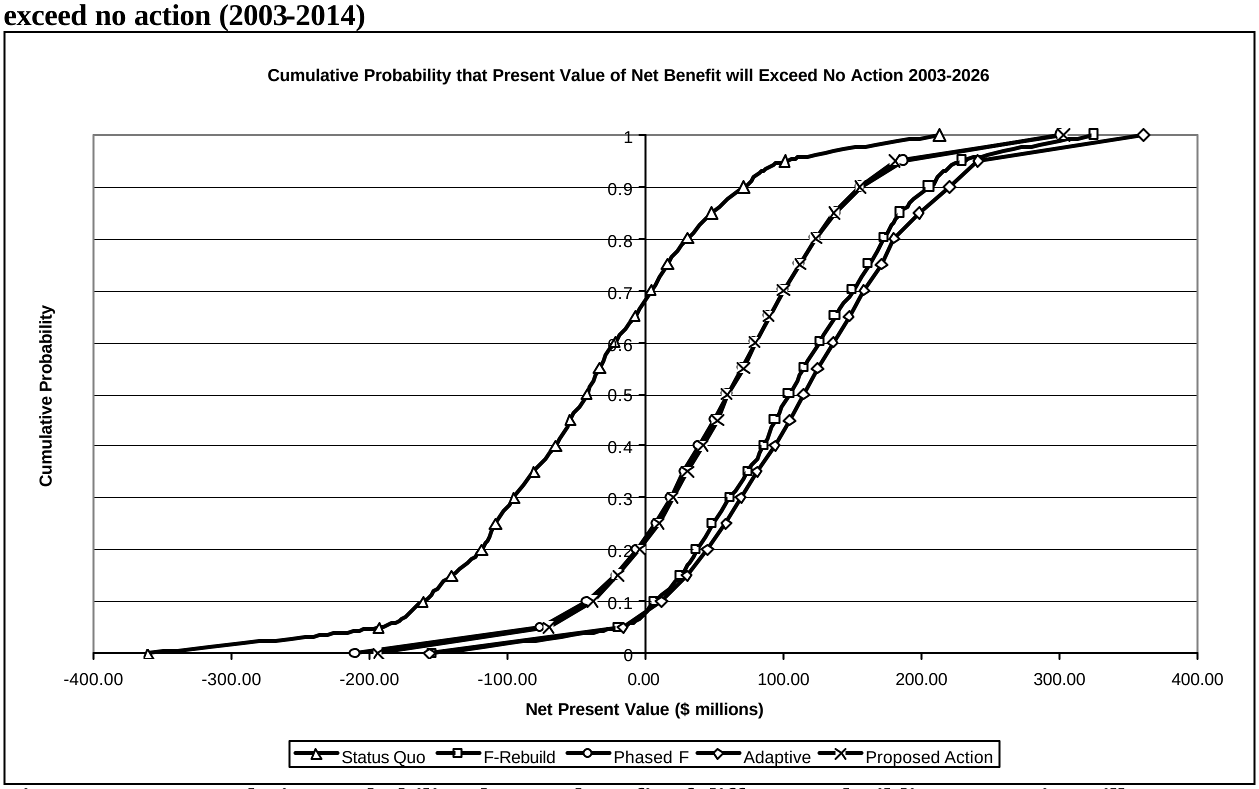


Figure 210 – Cumulative probability that net benefit of different rebuilding strategies will exceed no action (2003-2026)

5.4.3 Comparison of Economic Benefit of Alternative Rebuilding Times

The distinction between the two alternatives for rebuilding time frame is predictable. The 2009 rebuilding time would result in lower landings than 2014 until 2009, higher landings from 2010 to 2014, and roughly equivalent landings from 2015 onward as most stocks would be on a similar schedule of fishing mortality objectives after 2014 regardless of rebuilding time frame. Subtracting projected landings and related economic benefits of the 2014 rebuilding time frame from landings from the 2009 rebuilding alternative and summing these annual differences provides an estimate of the net gain from selecting the 2014 rebuilding time.

Over the projection period, the Constant fishing mortality rebuilding alternative would result in a net gain of 19 million pounds for a 2014 rebuilding time frame for most stocks (Figure 211). That, is the sum of the accumulated gains from 2003 to 2009 (denoted as area A) plus gains from 2015 to 2026 (area B) less accumulated losses from 2010 to 2014 (area C) is 19 million pounds. The Phased rebuilding alternative results in a small net loss of 1.4 million pounds. The relative difference between rebuilding alternatives is related to the fact that the phased fishing mortality rate alternative must resort to low fishing mortality rates in order the achieve rebuilding objectives within the prescribed time frame.

As noted previously price effects tend to moderate the relative magnitude of impact as compared to projected landings. This is why even though the Phased approach results in slightly less landings there is an overall net gain of $12 million in gross revenue. (Figure 212). Specifically, over the period where the phased alternative results in lower landings predicted prices increase which offsets the relative difference on landings. Where projected landings are higher predicted prices are lower but the difference in landings more than offsets the price change so the net effect is an increase in total revenue. The Constant fishing mortality rebuilding alternative also results in a net revenue gain, but at $35 million is higher than that of the Phased rebuilding alternative.

The accumulated difference in discounted economic benefit (the sum of consumer surplus and captain and crew income and vessel owner profit) between rebuilding time frames (2014 minus 2009) is a gain of $40 and $12 million respectively for the Constant fishing mortality and Phased rebuilding alternatives (Figure 213). This means that net economic benefit would be improved by selecting a 2014 rebuilding time frame for most stocks for either a Constant fishing mortality or a Phased rebuilding strategy. Note that this result is robust with respect to the choice of discount rate.

At discount rates from zero to twenty-percent the Constant fishing mortality strategy always results in higher net present value under a 2014 as compared to a 2009 rebuilding time for most stocks (Figure 214). The Phased approach for a 2014 rebuilding time does yield positive benefits at all discount rates above two-percent compared to a 2009 rebuilding time for most stocks. Even at discount rates of two-percent or less the difference between the 2009 and 2014 rebuilding times for the phased approach was small (no more than $11 million over a 23 year projection period).

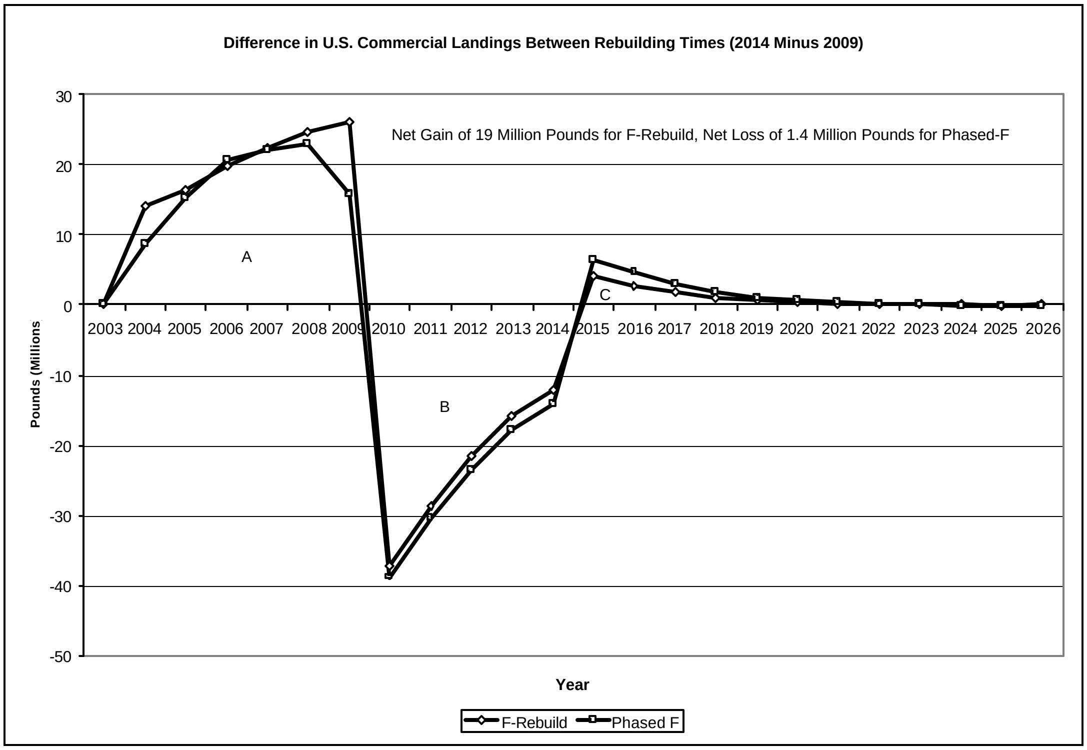


Figure 211 – Difference in commercial landings (2104 end date minus 2009 end date)

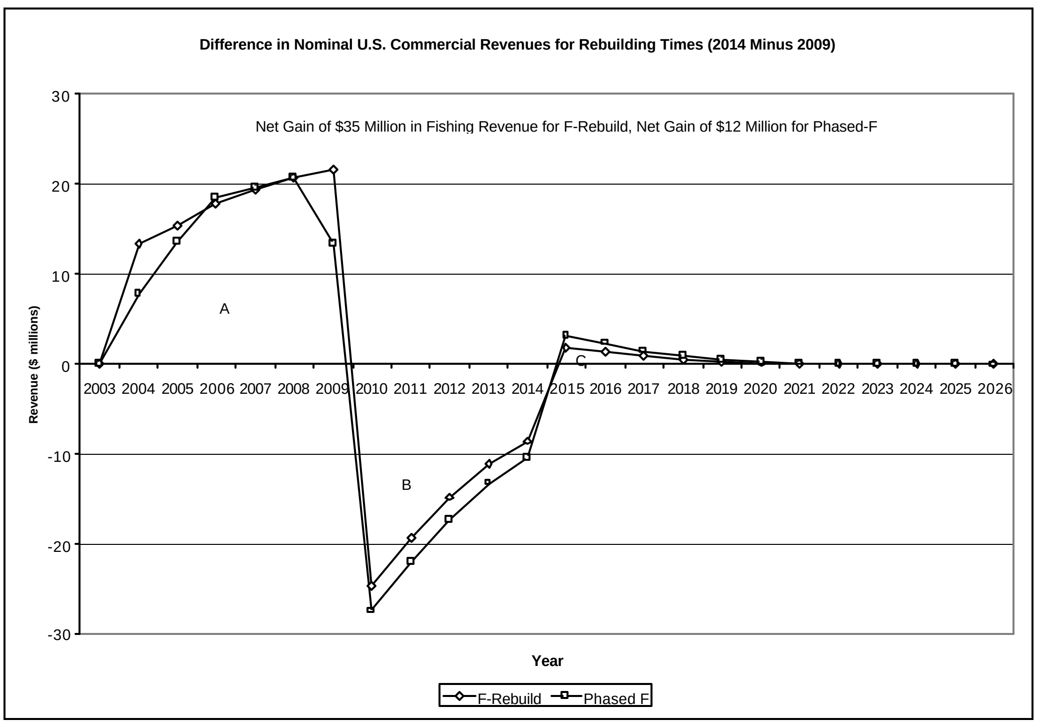


Figure 212 – Difference in nominal commercial revenues (2014 minus 2009 end date)

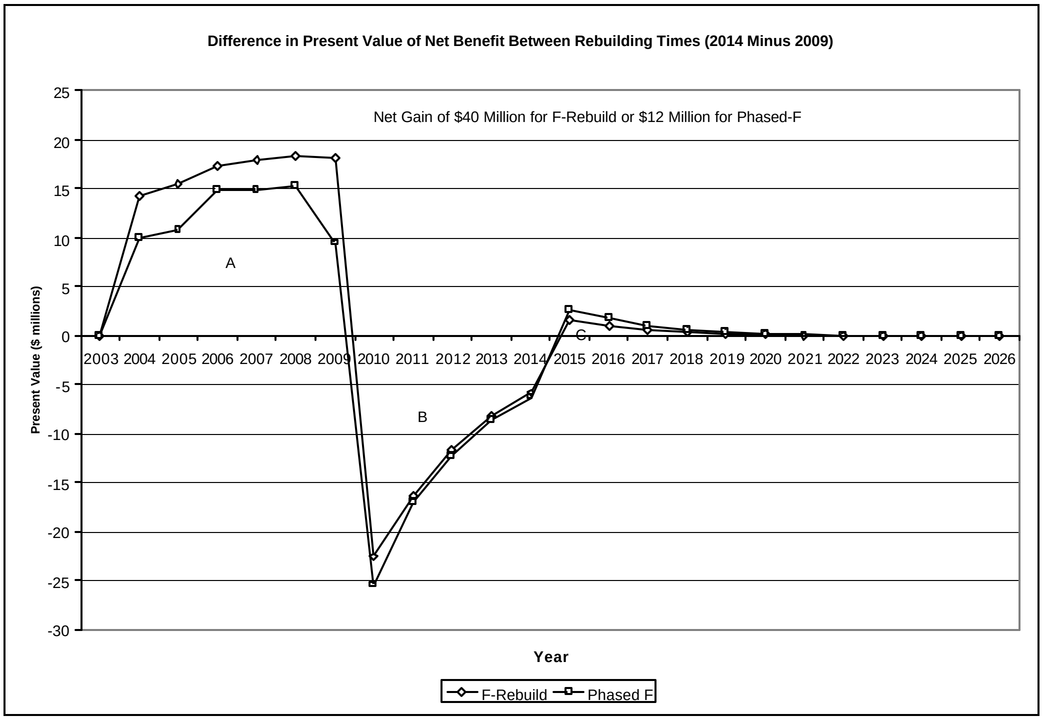


Figure 213 – Difference in net benefits (2014 minus 2009 end date)

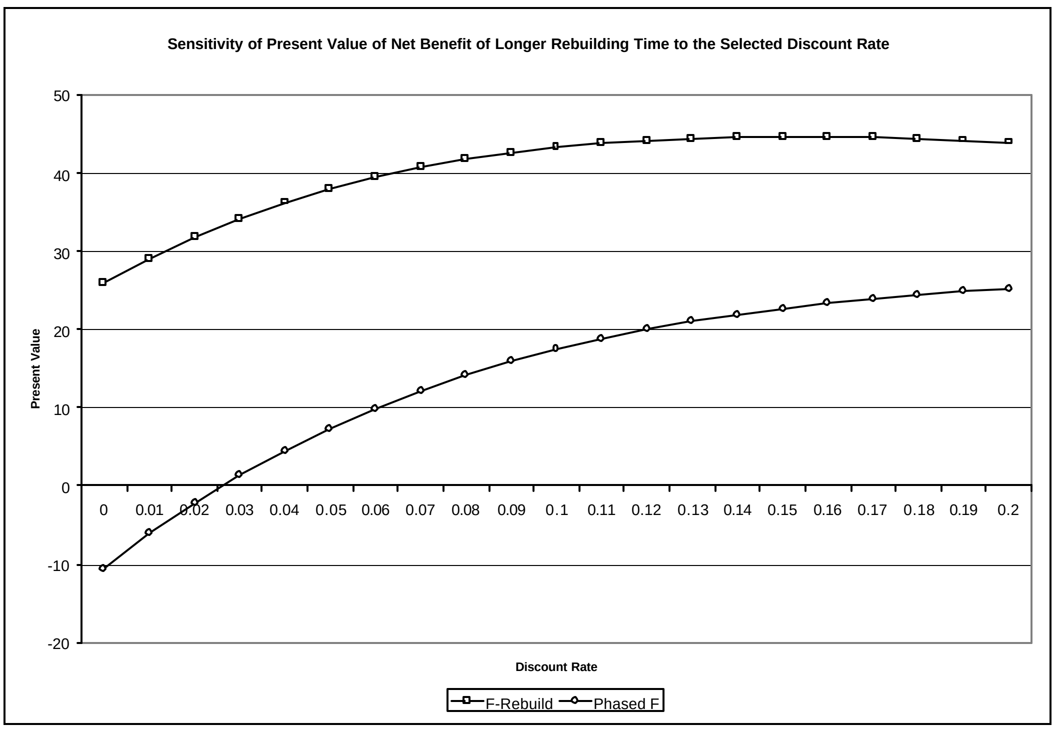


Figure 214 – Sensitivity of present value of net benefit of longer rebuilding time to selected discount rate

5.4.4 Relative Impacts on Commercial Fishing Gross Revenues

Quantitative analysis of the biological effectiveness of the proposed alternatives was accomplished primarily by using an area closure model described in section 5.1.1. This model provided a relative measure of the change in exploitation of each of the primary groundfish stocks that would be impacted, as well as a relative measure of gross revenue changes. The data embedded in this model include gear type, landings, value, effort, and monthly average CPUEs of the 10 regulated groundfish species, by area block, for the Northeast region. To reflect the most current economic and resource conditions the effort data were updated to calendar years 1998-2001 by averaging a combination of VTR activity records and dealer price data for trips that had a valid latitude-longitude coordinate. This means that the area closure model excludes two types of information for vessels that land some quantity of regulated groundfish: landings and value of groundfish with no valid lat-long coordinates and landings and value of all other species. While the former is implicitly included in the gross revenue changes predicted by the area-closure model by assuming that the revenue impacts for groundfish landings that do not have valid location information will be proportional to the revenue impacts for data that is included in the model, exclusion of the latter will tend to result in an upward bias in the magnitude of impact on a vessel's total annual income. Note that the magnitude of this bias will be greater/lesser for vessels the lesser/greater their dependence on regulated groundfish for fishing income. The procedures used to correct for this estimation bias are described below.

There are two major differences between this analysis and that used to compare rebuilding strategies. First, this analysis reflects the fishing mortality that is expected to be realized from a suite of management measures. In many instances, that mortality is different than the mortality that is targeted. Often the proposed management measures reduce mortality on stocks that are in good condition far lower than necessary. Second, this analysis is short-term in nature and does not reflect the revenue streams expected over the entire rebuilding program. Both of these issues are discussed in detail in a later section.

The proposed action relies on effort controls to achieve the biological objectives, but includes opportunities to mitigate economic impacts through the use of different categories of DAS. Alternative 1 relies on effort controls (primarily DAS reductions and area closures) to achieve the biological objectives. Alternative 2 also contains a variety of effort controls but would also implement a hard TAC as a back-stop measure to assure that conservation objectives are met. Alternatives 4 and 4A include a hard TAC as the primary measure while Alternative 3 would also include a hard TAC but would also have a variety of other effort controls as yet to be determined. Alternatives that include a hard TAC were modeled as if each vessel had a share of the TAC. In effect, each vessel makes fishing decisions based on the total available quota to that vessel. Once a vessel's quota for a given species has been exceeded that vessel is assumed to make fishing decisions with no bycatch of that species. This assumption introduces two potentially counter balancing biases. First, vessels are likely to be either unable or unwilling to cease fishing in times or areas to avoid bycatch of a species where the TAC has been met. To the extent that vessels do continue to fish while discarding, the actual losses in fishing revenues will be less than that estimated herein. Second, this assumption does not take into account the derby effects that are likely to arise with quota-based management without specification of quota sharing arrangements either to individuals or recognized groups. Thus, the economic impacts of Alternatives 2, 3, 4, and 4A may not capture the full distributive impacts should derby fisheries result, which will tend to favor those that can catch earliest and fastest.

Most of the alternatives are designed to achieve the mortality reductions necessary to rebuild stocks by 2014 or later. Alternative 4, the hard TAC alternatives, could also be used to rebuild stocks by 2009. Larger reductions in mortality are necessary to achieve a faster rebuilding rate, and the short-term economic impacts would be different than for a later rebuilding date. The impacts for a 2009 rebuilding date are shown separately from those for the 2014 rebuilding dates.

Data
Data for this analysis included landings data from the VTR, price data from dealer records, and NMFS Northeast Regional Office permit data. The permit data for fishing year 2001 were queried to obtain homeport state and vessel length for all vessels (exclusive of vessels removed through the permit buyback) that were included in the area closure model[1]. VTR data for calendar years 1998-2001 were used to estimate total landings of all species by trip and by year for each vessel. The VTR data were used to maintain consistency with the data used in the area closure model and because it was the only way to maintain individual vessel information for vessels that may have landed in the states of Connecticut or Delaware. Total trip value was estimated by applying monthly average price, by species, to each trip record.

Data for groundfish revenues and all other species revenues for trips where groundfish were landed and trips where no groundfish were landed were then summed by vessel and aggregated into total annual income from trips where groundfish were landed and total income from trips where no groundfish were landed. Note that income from groundfish and income from all other species on trips where groundfish were landed were summed separately. In this manner, the dollar value of other species income per dollar of groundfish revenue can be calculated and used to estimate changes in other species revenue on affected groundfish trips. Total income by vessel for calendar years 1998-2001 were then averaged to construct a final data set that included the vessel permit number, gear sector (consistent with that included in the area-closure model), home port state, vessel length, 4-year average annual income from groundfish trips, and 4-year average income from all other trips.

Procedures
The area closure model was designed to provide a relative measure of change in the exploitation of species included in the model. As such, a status quo or baseline is constructed by imposing a set of constraints on where and when vessels may fish, to observed fishing location data, where the constraints represent the selected management measures in place. By changing these constraints, an estimate of how effort may be redistributed and the resulting revenue and landings is produced. The percent change in exploitation and regulated groundfish revenue is then estimated relative to the status quo.

Given that the area closure model produces a relative measure of change, and that the status quo is dependent on the specified constraints, there is no direct mapping between the modeled status quo and landings data tabulated from either dealer or VTR records. However, in concept, the area closure status quo is designed to approximate the specified suite of management measures. For purposes of analysis these measures include DAS, trip limits, and combinations of year-round and rolling closures that had been implemented in FY2001. The economic effects of the proposed alternatives were then estimated relative to this simulated Status Quo in the following manner. For purposes of illustration a sample vessel with a total baseline income of $77,500 is used.

Step 1. For a given option, the area closure model was used to estimate the expected change in large-mesh groundfish revenues by vessel.

1Even though the area closure model may not have included 100 percent of any given vessels activity, all vessels that did record landing of one or more pounds of regulated groundfish were included. Therefore, the area closure model should be a reasonable census of vessels that have landed regulated groundfish during calendar years 1998-2001 and that currently hold a valid multispecies permit.

Step 2. The change from Step 1 was then applied to baseline (i.e., the 1998-2001 average) groundfish revenues to estimate expected groundfish revenue under that option. Assuming, for example, that the illustration vessel's baseline groundfish revenue were $50,000 and the change from Step 1 was -20%, the estimated Amendment 13 revenue would be (50,000)*(0.8) = $40,000.

Step 3. Changes in other species revenues on groundfish trips was estimated by multiplying the calculated average other species revenues per dollar of groundfish revenue by the resulting estimated groundfish revenue from Step 2. For the example vessel, assume that this average revenue rate were 0.25 (i.e. $0.25 in revenue from non-regulated groundfish per dollar of regulated groundfish). The change in other species revenues on groundfish trips would be (40,000)*(0.25) = $10,000.

Step 4. Assuming revenues from trips where no groundfish were landed would not be affected, the revenue from these trips was added to the estimated revenue from Steps 2 and 3 to calculate a new level of total fishing income. Assuming $15,000 in revenue from trips where no groundfish were landed the total income under the option would be ($40,000 + $10,000 + $15,000) = $65,000.

Step 5. The estimated proportional changes in total fishing income was then calculated as estimated income minus baseline income divided by baseline income or (65,000 - 77,500)/77,500 = -16.1%.

There are likely to be several potential sources of bias associated with the method described above. One source of bias is associated with the treatment of revenue from species other than regulated groundfish. This potential bias has two sources. First, applying a constant ratio of other species revenue to groundfish revenue may not be appropriate. Since the applied other species revenue rate was based on 1998-2001 data this rate could change (may increase for some vessels and decrease for others) as vessels change fishing strategies in response to changes in DAS, trip limits, or area closures.

The assumption that revenues earned on trips that do not land any groundfish would remain unchanged is the second source of bias. The extent that vessels adapt to any one or more of the proposed measures by increased targeting of species other than regulated groundfish, assuming no change in other species' revenues will result in an upward bias in the estimated economic impacts.

In addition to the aforementioned, there is a potential bias associated with the inability to account for possible improvements in catch rates with changing stock sizes. This bias will be more severe for stocks that respond quickly to management changes than for stocks that respond relatively slowly. In the former case, the estimated impacts will tend to be biased upward, while in the latter the economic impact estimates would not be affected. Note also that the extent of the bias will be greater the longer the time period associated with the projected impacts.

The introduction of bias in the estimated impacts would be a more significant problem if the primary purpose were to calculate the absolute magnitude of economic impacts. This is not the case. The primary purpose of the analysis is to provide a comparative assessment of economic impacts across alternatives, as well as an assessment of the distributive effects by gear sector, state, and vessel size class. Thus, even though some bias is likely, as long as each alternative is assessed in a consistent manner, the ordinal ranking of alternatives and the relative impacts across gears, sizes, and states should be preserved.

5.4.4.1 Impacts of the Proposed Action on Vessel Fishing Revenue

The Proposed Action would implement a large number of management measures some of which are quantifiable using the area closure model while many are not. The quantifiable measures include the impact of DAS reductions, area closures, and trip limits. Based on an evaluation of the proposed new baseline DAS allocations it was determined that the estimated DAS reduction would be approximately 45% from the 2000-2001 baseline. This reduction was combined with the proposed area closures and trip limits for Gulf of Maine cod, Georges Bank cod, Cape Cod/Gulf of Maine yellowtail and Southern New England yellowtail flounder to produce an estimate of relative revenue changes compared to 1998-2001 average conditions.

The estimated DAS reduction was based only on final allocations of category A DAS coupled with an assumed leasing of 3,000 DAS. This means that several key provisions of the Proposed Action that would provide opportunities for some vessels to increase fishing income could not be included. The potential use of category B DAS would provide fishing opportunities in Special Access Programs (Reserve B DAS) and other fisheries with low incidental catches of stocks of concern (Regular B DAS). The impacts of these opportunities could not be quantified because either type of B day could only be used under proscribed conditions that may not be typical of fishing activity that took place during the baseline period of 1998-2001. This means that observed CPUE data would not adequately capture revenue opportunities for either Regular or Reserve B DAS.

The Proposed Action would implement a sector allocation for Georges Bank cod hook and gillnet sectors. However, the actual number of participating vessels, how much quota they will receive and the manner in which the quota will be fished has yet to be determined. While hook and gillnet effort are included in the area closure model the resulting economic impacts for these sectors may not reflect realized impacts.

Last, while the total DAS reduction does include an estimate of 3,000 leased DAS it was not possible to determine exchanges between vessels. Instead, the leased DAS was treated as being equivalent to a DAS reduction offset to every vessel that would not have been available without DAS leasing. Specifically, using the estimated use rate (without DAS leasing) of 78% the expected DAS use would have been about 32,000 DAS; a 49% reduction from the baseline DAS use of 63,100 DAS (FY2000-2001 average). The 4% difference between the DAS reduction with and without leasing was spread across all vessels even though leasing would really mean that some vessels fish less while others would fish more.

The inability to capture the potential beneficial use of Category B DAS means that estimated revenue losses will be overestimated for vessels that will be able to participate in SAPs or will be able to use Regular B DAS. The potential affect of the Georges Bank cod hook and gillnet sector allocations on estimated revenue impacts are difficult to assess. Having a sector allocation does not mean that the sector participants will be able to take any more Georges Bank cod than they would otherwise. This means that the impact on the sector as a whole may be reasonably estimated but that individual vessel impacts may not be adequately captured. Thus, while hook sector impacts are reported herein, it is hard to predict the direction of error or bias in these estimates.

A final consideration relates to the interpretation of the results to follow for the Proposed Action as well as that of the non-selected alternatives. As noted in section 5.4.4 the area closure model itself produces a set of revenue estimates for a baseline condition. This baseline condition is formulated by modeling fishing time and area decisions subject to FY2001 regulatory constraints and 1998-2001 average resource conditions. All revenue impacts are based on a comparison of the estimated revenues associated with the Proposed Action management measures applied to the same 1998-2001 resource conditions. Interpretation of these results must be tempered by the fact that they are relative to a baseline resource condition and that they represent a change from average 1998-2001 revenues. The former means that estimated revenue impacts do not take into account improved productivity due to changes in stock size (i.e. realized revenue impacts are likely to be lower than predicted) while the latter means that the resulting revenue changes should be thought of as cumulative (i.e. they include the effect of the interim FY2002-2003 measures as well as anticipated FY2004 impacts) and not a marginal change from current (FY2003) conditions.

The Proposed Action would have an estimated $40 million reduction in total fishing revenues from groundfish trips compared to the 1998-2001 average. Since regulated groundfish account for approximately 60% of total groundfish trip income, losses in groundfish revenue alone would be about $24 million and revenue losses from all species other than regulated groundf ish would be $16 million. Due to differences in dependence on groundfish and normal fishing patterns, these total revenue losses are not equally distributed across all vessels. In fact, revenue changes were found to be quite skewed which means that reporting average or even median vessel impacts fails to identify the full range of revenue losses across the groundfish fleet. For this reason, revenue impacts are reported for the 10th, 25th, 50th (median), 75th and 90th percentile of the distribution of impacted vessels sorted in ascending order from most negatively to least impacted vessel (Table 184). Each percentile forms an interval that represents a specific number of vessels as well as the lower and upper range of impact on vessels between percentiles. For example, since there are 848 vessels included in the analysis, there are 85 (rounding to the nearest whole number) vessels at or below the 10th percentile. Gross revenues losses for these vessels would be 40.4% or greater for the Proposed Action. Revenue loss for the 127 vessels between the 10th and 25th percentile would range from 40.4 to 34.3%. Note that the values reported in the column labeled "Upper" represent the revenue change at the specified percentile while the values in the column labeled "Lower" represent the revenue change at the next lower percentile. For example, the revenue loss for the median (50th percentile) vessel was 19.60% and the revenue loss at the 25th percentile was 34.3%.

Note that at the 90th percentile revenue loss was estimated to be zero or no change from 1998-2001 average conditions. Even with a 45% reduction in DAS some vessels could experience no change or an improvement in revenues under a variety of different circumstances. For example, a doubling of the GOM cod trip limit (compared to FY2001) would offset the DAS reduction if the vessel had a very high dependence on Gulf of Maine cod. The area closures under the Proposed Action also differ from that of FY2001. Vessels with a high affinity for a specific area or of limited range may be highly sensitive to specific closures. In these cases, changes in area closures may offset DAS reductions. This highlights the relationship between efficiency and regulatory design. That is, economic impacts may be reduced by identifying measures that permit vessel's to operate as efficiently as possible within available effort allocations. The trip limit is one such example; the tradeoff between DAS and area closures is another. For example, for vessels with limited range a larger DAS reduction with fewer area closures may yield higher revenues as compared to a lower DAS reduction with more area closures.

Impact by Dependence on Groundfish

The impact on individual vessels depends on a variety of factors. Vessels that have a relatively high dependence on groundfish would be more affected by a given reduction in groundfish trip income than another vessel that is engaged in other fisheries. For example, if vessel A earned

80% and vessel B earned 20% of annual revenue from groundfish trips, a 20% reduction in groundfish revenue for both vessels would result in 16% reduction in total fishing income for a vessel A, but would be only a 4% reduction in total annual fishing revenue for vessel B.

For the Proposed Action, gross fishing revenue losses increase with higher dependence on groundfish trip income (Table 185). The median revenue loss for vessels that depend on groundfish for 25% or less of fishing revenue was estimated to be 2.5% while the median loss for vessels with 75% or greater dependence on groundfish was 35.0%. This difference between vessels from lower to higher levels of dependence on groundfish trip income is consistent for all percentiles.

	Number of Vessels	Lower	Upper
10th Percentile and Below	85	Minimum	-40.4%
10th to 25th Percentile	127	-40.4%	-34.3%
25th to 50th Percentile	212	-34.3%	-19.6%
50th to 75th Percentile	212	-19.6%	-5.4%
75th to 90th Percentile	127	-5.4%	0.0%
Above 90th Percentile	85	0.0%	Maximum

Table 184 - Fleet-Wide Impacts of Proposed Action

Dependence on Groundfish	Number of Vessels	Lower	Upper
Less than 25% (n = 182)			
10th Percentile and Below	18	Minimum	-9.5%
10th to 25th Percentile	27	-9.5%	-6.6%
25th to 50th Percentile	46	-6.6%	-2.5%
50th to 75th Percentile	46	-2.5%	0.0%
75th to 90th Percentile	27	0.0%	0.4%
Above 90th Percentile	18	0.4%	Maximum
25 to less than 50% (n = 142)			
10th Percentile and Below	14	Minimum	-21.0%
10th to 25th Percentile	21	-21.0%	-16.7%
25th to 50th Percentile	36	-16.7%	-13.2%
50th to 75th Percentile	36	-13.2%	-10.1%
75th to 90th Percentile	21	-10.1%	-0.2%
Above 90th Percentile	14	-0.2%	Maximum
50% to less than 75% (n = 153)			
10th Percentile and Below	15	Minimum	-32.0%
10th to 25th Percentile	23	-32.0%	-27.6%
25th to 50th Percentile	38	-27.6%	-23.1%
50th to 75th Percentile	38	-23.1%	-16.3%
75th to 90th Percentile	23	-16.3%	-3.1%
Above 90th Percentile	15	-3.1%	Maximum
75% or Greater (n = 371)			
10th Percentile and Below	37	Minimum	-45.2%
10th to 25th Percentile	56	-45.2%	-40.0%
25th to 50th Percentile	93	-40.0%	-35.0%
50th to 75th Percentile	93	-35.0%	-27.2%
75th to 90th Percentile	56	-27.2%	0.0%
Above 90th Percentile	37	0.0%	Maximum

Table 185 - Revenue Impacts by Dependency on Groundfish for Proposed Action

Impact by Entity Size in Terms of Gross Sales

Dependence on groundfish is defined as the proportion of groundfish trip income of total fishing income. This measure does not take into account the level of total fishing income since a vessel with $5,000 in total fishing income could have the same level of dependence on groundfish as a vessel with $500,000 in total fishing income. In relative terms the impact on these two vessels may be the same but the total impact may be very different since the former may have income from other non-fishing sources while for the latter fishing may be the sole source of income and may support a larger number of people. To examine the relative impact on vessels with differing levels of groundfish revenues the estimated distribution of Status Quo revenues was divided into approximate quartiles resulting in the following revenue classes; $35,000 or less, $35,001 to $100,000, $100,001 to $250,000, and $250,001 or more.

As was the case for groundfish dependence, the relative impact on vessels with higher gross sales was estimated to be greater at all percentiles, although the relative impact for the most affected vessels (the 10th percentile) was not markedly different (-38 to 43%) for all sales categories from $35,001 and above (Table 186). Note that the fact that estimated relative revenue losses were generally higher for vessels with higher gross sales also means that the revenue losses in absolute terms would also be greater.

The relative impact on vessels with gross groundfish sales of $35,000 or less was substantially lower than vessels with higher gross sales. In fact, 25% of these vessels were estimated to earn higher fishing income under the Proposed Action as compared to 1998-2001 average revenue. Vessels with increased revenue tended to be smaller vessels using gillnet or hook gear; vessels that would benefit relatively more from the increased GOM cod trip limit and whose revenue would be more sensitive to differences in area closures.

Impact by Gear Groups
Median revenue losses for hook and gillnet gear were similar (7.7 and 9.7% respectively) but were much lower than that of median trawl vessel impacts (-22.7%) (Table 187). However, the relative revenue impact among the most impacted vessels was similar across all gear groups (40 to 44% at the 10th percentile). At all percentiles above the median trawl vessels were estimated to incur revenue losses while revenue changes are positive for gillnet and hook gear. In fact, both gillnet and hook gear groups appear to be split between vessels that may experience significant revenue losses and vessels that may experience revenue gains. This disparity is likely due to differences in dependence on Georges Bank cod and Gulf of Maine cod. Because cod tends to represent such a high proportion of total fishing income for these two gear groups revenue are very sensitive to changes in cod trip limits. Thus, while the Gulf of Maine cod trip limit would be double that of FY2001 the Georges Bank cod trip limit is more restrictive. This means that even with a 45% DAS reduction, hook and gillnet vessels with a high dependence on Gulf of Maine cod can increase total fishing income while vessels with high dependence on Georges Bank cod experience revenue losses.

Gross Groundfish Sales Intervals	Number of Vessels	Lower	Upper
$35,000 or less (n = 209)			
10th Percentile and Below	21	Minimum	-27.1%
10th to 25th Percentile	31	-27.1%	-9.8%
25th to 50th Percentile	52	-9.8%	-1.2%
50th to 75th Percentile	52	-1.2%	0.3%
75th to 90th Percentile	31	0.3%	18.5%
Above 90th Percentile	21	18.5%	Maximum
$35,001 to $100,000 (n = 245)			
10th Percentile and Below	25	Minimum	-38.4%
10th to 25th Percentile	37	-38.4%	-26.9%
25th to 50th Percentile	61	-26.9%	-15.7%
50th to 75th Percentile	61	-15.7%	-6.2%
75th to 90th Percentile	37	-6.2%	0.0%
Above 90th Percentile	25	0.0%	Maximum
$100,001 to $250,000 (n = 197)			
10th Percentile and Below	21	Minimum	-42.0%
10th to 25th Percentile	31	-42.0%	-36.4%
25th to 50th Percentile	47	-36.4%	-29.0%
50th to 75th Percentile	47	-29.0%	-17.3%
75th to 90th Percentile	31	-17.3%	-8.7%
Above 90th Percentile	21	-8.7%	Maximum
$250,001 or more (n = 187)			
10th Percentile and Below	19	Minimum	-42.6%
10th to 25th Percentile	28	-42.6%	-39.4%
25th to 50th Percentile	47	-39.4%	-34.9%
50th to 75th Percentile	47	-34.9%	-22.4%
75th to 90th Percentile	28	-22.4%	-13.8%
Above 90th Percentile	19	-13.8%	Maximum

Table 186 - Revenue Impacts by Size of Gross Groundfish Sales for Proposed Action

	Number of Vessels	Lower	Upper
Gillnet Gear (n= 181)			
10th Percentile and Below	18	Minimum	-43.5%
10th to 25th Percentile	27	-43.5%	-33.9%
25th to 50th Percentile	45	-33.9%	-9.7%
50th to 75th Percentile	45	-9.7%	0.2%
75th to 90th Percentile	27	0.2%	13.0%
Above 90th Percentile	18	13.0%	Maximum
Hook Gear (n=75)			
10th Percentile and Below	8	Minimum	-41.9%
10th to 25th Percentile	11	-41.9%	-21.9%
25th to 50th Percentile	19	-21.9%	-7.7%
50th to 75th Percentile	19	-7.7%	2.7%
75th to 90th Percentile	11	2.7%	29.2%
Above 90th Percentile	8	29.2%	Maximum
Trawl Gear (n=592)			
10th Percentile and Below	59	Minimum	-40.2%
10th to 25th Percentile	89	-40.2%	-34.8%
25th to 50th Percentile	148	-34.8%	-22.7%
50th to 75th Percentile	148	-22.7%	-10.3%
75th to 90th Percentile	89	-10.3%	-3.0%
Above 90th Percentile	59	-3.0%	Maximum

Table 187 - Proportional Change in Gross Annual Revenues by Gear Group for Proposed Action

Impact by Vessel Length Class
The Proposed Action revenue impacts on both medium and large trawls were estimated to be similar at all percentiles for both large and medium sized vessels with median revenue loss of at least 22.5 and 24.3% respectively (Table 188). For small vessels, the most impacted vessels would experience potential revenue losses of at least 38% at the 10th percentile and 21.7% at the 25th percentile. However, median revenue losses would be less than 5% and vessels at and above the 75th percentile would experience revenue gains. The upper half of the distribution of small vessel revenue impact is likely to be dominated by the same hook or gillnet vessels that comprised the group of vessels with positive revenue impacts shown in Table 187.

Impact by Gear/Length Groups
Impacts among hook vessels of different size indicate that the Proposed Action would have a similar pattern of impact regardless of size although small hook vessels would experience revenues losses of about 10-percentage points greater for the median vessel and at all percentiles below the median (Table 189). By contrast, the Proposed Action would have larger revenue impacts on large as compared to small gillnet vessels.

Compared to either medium or large vessels, small trawl vessels were estimated to incur lower revenue reductions at all percentiles. Among medium and large trawl vessels the estimated revenue losses were similar although up to the median vessel revenue losses were higher for trawl than they were for medium vessels. However, at percentiles above the median, medium vessel revenue losses were higher than that of large trawlers.

Large (n=190)	Number of Vessels	Lower	Upper
10th Percentile and Below	19	Minimum	-41.4%
10th to 25th Percentile	29	-41.4%	-37.2%
25th to 50th Percentile	48	-37.2%	-24.3%
50th to 75th Percentile	48	-24.3%	-11.6%
75th to 90th Percentile	29	-11.6%	-3.6%
Above 90th Percentile	19	-3.6%	Maximum
Medium (n=485)			
10th Percentile and Below	49	Minimum	-40.2%
10th to 25th Percentile	73	-40.2%	-34.7%
25th to 50th Percentile	121	-34.7%	-22.5%
50th to 75th Percentile	121	-22.5%	-8.6%
75th to 90th Percentile	73	-8.6%	0.0%
Above 90th Percentile	49	0.0%	Maximum
Small (n=173)			
10th Percentile and Below	17	Minimum	-38.1%
10th to 25th Percentile	26	-38.1%	-21.7%
25th to 50th Percentile	43	-21.7%	-4.8%
50th to 75th Percentile	43	-4.8%	0.2%
75th to 90th Percentile	26	0.2%	23.3%
Above 90th Percentile	17	23.3%	Maximum

Table 188 - Proportional Change in Gross Annual Revenues by Vessel Size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Proposed Action

Small Hook (n=51)	Number of Vessels	Lower	Upper
10th Percentile and Below	5	Minimum	-42.9%
10th to 25th Percentile	8	-42.9%	-27.2%
25th to 50th Percentile	13	-27.2%	-10.8%
50th to 75th Percentile	13	-10.8%	2.7%
75th to 90th Percentile	8	2.7%	29.2%
Above 90th Percentile	5	29.2%	Maximum
Large Hook (n=24)			
10th Percentile and Below	2	Minimum	-31.9%
10th to 25th Percentile	4	-31.9%	-17.9%
25th to 50th Percentile	6	-17.9%	-0.6%
50th to 75th Percentile	6	-0.6%	3.9%
75th to 90th Percentile	4	3.9%	20.3%
Above 90th Percentile	2	20.3%	Maximum
Small Trawl (n=187)			
10th Percentile and Below	19	Minimum	-37.9%
10th to 25th Percentile	28	-37.9%	-30.9%
25th to 50th Percentile	47	-30.9%	-17.4%
50th to 75th Percentile	47	-17.4%	-5.0%
75th to 90th Percentile	28	-5.0%	0.0%
Above 90th Percentile	19	0.0%	Maximum
Medium Trawl (n=218)			
10th Percentile and Below	22	Minimum	-40.4%
10th to 25th Percentile	33	-40.4%	-34.9%
25th to 50th Percentile	55	-34.9%	-25.4%
50th to 75th Percentile	55	-25.4%	-13.2%
75th to 90th Percentile	33	-13.2%	-7.1%
Above 90th Percentile	22	-7.1%	Maximum
Large Trawl (n=187)			
10th Percentile and Below	19	Minimum	-41.5%
10th to 25th Percentile	28	-41.5%	-37.2%
25th to 50th Percentile	47	-37.2%	-24.4%
50th to 75th Percentile	47	-24.4%	-11.6%
75th to 90th Percentile	28	-11.6%	-3.6%
Above 90th Percentile	19	-3.6%	Maximum

Table 189 - Proportional Change in Gross Annual Revenues by Gear Group and Vessel Size (For trawl vessels Large = +70'; Medium = 50 to 70', Small = Under 50', For gillnet and hook vessels small = Under 40', Large = 40+) for Proposed Action

Small Hook (n=51)	Number of Vessels	Lower	Upper
Small Gillnet (n=63)			
10th Percentile and Below	6	Minimum	-42.0%
10th to 25th Percentile	9	-42.0%	-15.5%
25th to 50th Percentile	16	-15.5%	-0.2%
50th to 75th Percentile	16	-0.2%	11.6%
75th to 90th Percentile	9	11.6%	31.4%
Above 90th Percentile	6	31.4%	Maximum
Large Gillnet (n=118)			
10th Percentile and Below	12	Minimum	-45.2%
10th to 25th Percentile	18	-45.2%	-37.2%
25th to 50th Percentile	30	-37.2%	-18.2%
50th to 75th Percentile	30	-18.2%	0.0%
75th to 90th Percentile	18	0.0%	3.2%
Above 90th Percentile	12	3.2%	Maximum

Table 189 - Proportional Change in Gross Annual Revenues by Gear Group and Vessel Size (For trawl vessels Large = +70'; Medium = 50 to 70', Small = Under 50', For gillnet and hook vessels small = Under 40', Large = 40+) for Proposed Action (cont.)

Impacts by Home Port State

The Proposed Action would result in a revenue loss of at least one-third for 25% of all vessels with a Maine, New Hampshire or a Massachusetts homeport (Table 190). Across all states revenue impacts would be lowest for New Jersey vessels. Revenue impacts on Rhode Island would be quite similar to that of Connecticut/New York vessels. Among states that border the Gulf of Maine the revenue impacts for Massachusetts and Maine vessels were similar at all percentiles while revenue impacts on New Hampshire vessels were lower for the median vessel and for all other percentiles above the median.

Impacts by Port Groups

Median revenue impacts were at least -30% in the Boston, Chatham/Harwich, New Bedford, Portland, and Upper Mid-Coast Maine port groups (Table 191). Median revenue losses were between 20 and 29% in the port groups of Gloucester, Portsmouth and Provincetown. Among the remaining port groups median revenue losses were about 16% in Point Judith and South Shore Massachusetts while median impacts were -11% or less everywhere else.

Home Port State	Number of Vessels	Lower	Upper
Massachusetts (n=396)			
10th Percentile and Below	40	Minimum	-43.4%
10th to 25th Percentile	59	-43.4%	-38.0%
25th to 50th Percentile	99	-38.0%	-26.2%
50th to 75th Percentile	99	-26.2%	-8.9%
75th to 90th Percentile	59	-8.9%	1.7%
Above 90th Percentile	40	1.7%	Maximum
Maine (n=131)			
10th Percentile and Below	13	Minimum	-38.0%
10th to 25th Percentile	20	-38.0%	-35.0%
25th to 50th Percentile	33	-35.0%	-29.0%
50th to 75th Percentile	33	-29.0%	-6.5%
75th to 90th Percentile	20	-6.5%	0.0%
Above 90th Percentile	13	0.0%	Maximum
New Hampshire (n=60)			
10th Percentile and Below	6	Minimum	-39.7%
10th to 25th Percentile	9	-39.7%	-34.3%
25th to 50th Percentile	15	-34.3%	-16.9%
50th to 75th Percentile	15	-16.9%	0.6%
75th to 90th Percentile	9	0.6%	22.5%
Above 90th Percentile	6	22.5%	Maximum
New Jersey (n=45)			
10th Percentile and Below	5	Minimum	-17.8%
10th to 25th Percentile	7	-17.8%	-13.1%
25th to 50th Percentile	11	-13.1%	-9.7%
50th to 75th Percentile	11	-9.7%	-3.9%
75th to 90th Percentile	7	-3.9%	-1.2%
Above 90th Percentile	5	-1.2%	Maximum
New York/Connecticut (n = 95)			
10th Percentile and Below	10	Minimum	-38.0%
10th to 25th Percentile	14	-38.0%	-22.5%
25th to 50th Percentile	24	-22.5%	-12.5%
50th to 75th Percentile	24	-12.5%	-3.3%
75th to 90th Percentile	14	-3.3%	0.0%
Above 90th Percentile	10	0.0%	Maximum
Rhode Island (n=96)			
10th Percentile and Below	10	Minimum	-33.6%
10th to 25th Percentile	14	-33.6%	-25.2%
25th to 50th Percentile	24	-25.2%	-15.6%
50th to 75th Percentile	24	-15.6%	-6.3%
75th to 90th Percentile	14	-6.3%	0.0%
Above 90th Percentile	10	0.0%	Maximum
All Other (n=25)			
10th Percentile and Below	3	Minimum	-32.0%
10th to 25th Percentile	4	-32.0%	-14.6%
25th to 50th Percentile	6	-14.6%	-7.1%
50th to 75th Percentile	6	-7.1%	-3.6%
75th to 90th Percentile	4	-3.6%	0.0%
Above 90th Percentile	3	0.0%	Maximum

Table 190 - Proportional Change in Gross Revenue by Home Port State for Proposed Action

		Proposed Action	
Port Group	Number of Vessels	Lower	Upper
Boston (n=20)			
25th Percentile and Below	5	Minimum	-39.3%
25th to 50th Percentile	5	-39.3%	-33.4%
50th to 75th Percentile	5	-33.4%	-11.0%
Above 75th Percentile	5	-11.0%	Maximum
Chatham/Harwich (n=50)			
25th Percentile and Below	13	Minimum	-49.3%
25th to 50th Percentile	13	-49.3%	-33.0%
50th to 75th Percentile	13	-33.0%	-18.3%
Above 75th Percentile	13	-18.3%	Maximum
Eastern Long Island (n=40)			
25th Percentile and Below	10	Minimum	-18.3%
25th to 50th Percentile	10	-18.3%	-11.0%
50th to 75th Percentile	10	-11.0%	-3.5%
Above 75th Percentile	10	-3.5%	Maximum
Gloucester (n=97)			
25th Percentile and Below	24	Minimum	-38.8%
25th to 50th Percentile	24	-38.8%	-28.8%
50th to 75th Percentile	24	-28.8%	-2.9%
Above 75th Percentile	24	-2.9%	Maximum
New Bedford (n=96)			
25th Percentile and Below	24	Minimum	-38.9%
25th to 50th Percentile	24	-38.9%	-34.7%
50th to 75th Percentile	24	-34.7%	-23.5%
Above 75th Percentile	24	-23.5%	Maximum
New Hampshire Seacoast (n=32)			
25th Percentile and Below	8	Minimum	-29.4%
25th to 50th Percentile	8	-29.4%	-9.8%
50th to 75th Percentile	8	-9.8%	5.6%
Above 75th Percentile	8	5.6%	Maximum
Point Judith (n=49)			
25th Percentile and Below	12	Minimum	-28.5%
25th to 50th Percentile	12	-28.5%	-15.8%
50th to 75th Percentile	12	-15.8%	-10.5%
Above 75th Percentile	12	-10.5%	Maximum

Table 191 - Proportional Change in Gross Annual Revenues by Port Group for Proposed Action

		Proposed Action	
Port Group	Number of Vessels	Lower	Upper
Portland (n=39)			
25th Percentile and Below	10	Minimum	-40.0%
25th to 50th Percentile	10	-40.0%	-36.5%
50th to 75th Percentile	10	-36.5%	-29.4%
Above 75th Percentile	10	-29.4%	Maximum
Portsmouth (n=26)			
25th Percentile and Below	7	Minimum	-36.9%
25th to 50th Percentile	7	-36.9%	-25.2%
50th to 75th Percentile	7	-25.2%	-8.2%
Above 75th Percentile	7	-8.2%	Maximum
Provincetown (n=19)			
25th Percentile and Below	5	Minimum	-27.6%
25th to 50th Percentile	5	-27.6%	-21.0%
50th to 75th Percentile	5	-21.0%	-12.4%
Above 75th Percentile	5	-12.4%	Maximum
South Shore Massachusetts (n=37)			
25th Percentile and Below	9	Minimum	-29.6%
25th to 50th Percentile	9	-29.6%	-16.3%
50th to 75th Percentile	9	-16.3%	0.3%
Above 75th Percentile	9	0.3%	Maximum
Upper Mid-Coast Maine (n=19)			
25th Percentile and Below	5	Minimum	-34.8%
25th to 50th Percentile	5	-34.8%	-31.8%
50th to 75th Percentile	5	-31.8%	-25.6%
Above 75th Percentile	5	-25.6%	Maximum
Other (n=325)			
25th Percentile and Below	81	Minimum	-23.7%
25th to 50th Percentile	81	-23.7%	-11.4%
50th to 75th Percentile	81	-11.4%	-2.3%
Above 75th Percentile	81	-2.3%	Maximum

Table 191 - Proportional Change in Gross Annual Revenues by Port Group for Proposed Action (cont.)

5.4.4.2 Impacts on Vessel Fishing Revenue of Alternative 1

Alternative 1 contains two different proposed DAS use levels and two different trip limit alternatives for Georges Bank Cod. Alternative 1A has a DAS use of 28,400 days and a Georges Bank cod trip limit of 2,000 pounds per DAS up to 20,000 pounds per trip. Alternative 1B has the same Georges Bank cod trip limit but would reduce DAS use to 41,050 in the first year, with used DAS declining to 22,100 DAS in the fourth year after implementation. Alternative 1C would have the same DAS use as 1A but would implement a Georges Bank cod trip limit that would vary by gear and season. Similarly, Alternative 1D would implement the same Georges Bank cod trip limit as 1C but would reduce DAS use to the same level as 1B. Alternative 1A would result in an estimated reduction of $45.6 million in total fishing income while Alternative 1B would have a lower impact ($28.3 million) in the first year. Due to a more restrictive Georges Bank cod trip limit, Alternative 1C would result in an estimated reduction in total fishing revenues of $49.1 million and Alternative 1D would result in a reduction of $33 million.

Vessel-level impacts are not uniformly distributed with some vessels being much more impacted than others. Because of the tendency for revenue impacts to be skewed, revenue impacts are reported for the 10th, 25th, 50th (median), 75th and 90th percentile of the distribution of impacted vessels sorted in ascending order from most negatively to least impacted vessel (Table 192). Each percentile forms an interval that represents a specific number of vessels as well as the lower and upper range of impact on vessels between percentiles. For example, since there are 848 vessels included in the analysis, there are 85 (rounding to the nearest whole number) vessels at or below the 10th percentile. Gross revenues for these vessels would decline 46.3% or greater for Alternative 1A but would decline 29.8% or more for Alternative 1B. Similarly, the revenue loss for the 127 vessels between the 10th and 25th percentile would range from 46.3 to 40.1% for Alternative 1A and from 29.8 to 25.4% for Alternative 1B. Note that the values reported in the column labeled "Upper" represent the revenue change at the specified percentile while the values in the column labeled "Lower" represent the revenue change at the next lower percentile. For example, the revenue loss for the median (50th percentile) vessel was 24.0% and the revenue loss at the 25th percentile was 40.1%. Since 1A and 1B differ only in their DAS reduction, the option with the least DAS reduction results in lower revenue impacts for all vessels. It should be remembered, however, that in Alternatives 1B and 1D, by year four the DAS reductions are lower than those under Alternatives 1A and 1C.

At the upper end of the distribution of impacted vessels are some vessels that may realize an increase in fishing revenues in spite of the DAS reductions proposed under Alternative 1. For example, the 85 vessels above the 90th percentile would realize either no change or some modest improvement in fishing income because of the increase in the GOM cod trip limit from 400 under No Action to 800 pounds per day as well as differences in the suite of closures between what had been in place in FY2001 and that proposed under Alternative 1. That is, compared to No Action, Alternative 1 measures permit a small number of vessels (about 10%) to be more efficient. For these vessels, the gain in efficiency is sufficient to more than offset the DAS losses resulting in a net increase in fishing income relative to No Action. This highlights the relationship between efficiency and regulatory design. That is, economic impacts may be reduced by identifying measures that permit vessels to operate as efficiently as possible within available effort allocations. The trip limit is one such example; the tradeoff between DAS and area closures is another. For example, for vessels with limited range a larger DAS reduction with fewer area closures may yield higher revenues as compared to a lower DAS reduction with more area closures.

At a fleet-wide level, Alternatives 1C and 1D have similar predicted revenue losses to that of Alternatives 1A and 1B. However, because of the comparatively more restrictive Georges Bank cod trip limit, the Alternative 1C and 1D revenue impacts at each percentile are higher by 2-3 percentage points.

		Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
10th Percentile and Below	85	Min.	-46.3%	Min.	-29.8%	Min.	-48.8%	Min.	-34.2%
10th to 25th Percentile	127	-46.3%	-40.1%	-29.8%	-25.4%	-48.8%	-42.2%	-34.2%	-28.0%
25th to 50th Percentile	212	-40.1%	-24.0%	-25.4%	-14.7%	-42.2%	-25.6%	-28.0%	-16.9%
50th to 75th Percentile	212	-24.0%	-7.2%	-14.7%	-3.0%	-25.6%	-8.8%	-16.9%	-4.9%
75th to 90th Percentile	127	-7.2%	0.0%	-3.0%	0.6%	-8.8%	0.0%	-4.9%	0.2%
Above 90th Percentile	85	0.0%	Max.	0.6%	Max.	0.0%	Max.	0.2%	Max.

Table 192 - Fleet-Wide Impacts of Alternatives 1A, 1B, 1C and 1D

Impact by Dependence on Groundfish

The impact on individual vessels depends on a variety of factors. Vessels that have a relatively high dependence on groundfish would be more affected by a given reduction in groundfish trip income than another vessel that is engaged in other fisheries. For example, if vessel A earned 80% and vessel B earned 20% of annual revenue from groundfish trips, a 20% reduction in groundfish revenue for both vessels would result in 16% reduction in total fishing income for a vessel A, but would be only a 4% reduction in total annual fishing revenue for vessel B.

For Alternative 1A and 1B the impact on gross fishing revenue increases with higher dependence on groundfish trip income (Table 193). For Alternative 1A, the median revenue loss for vessels that depend on groundfish for 25% or less of fishing revenue was estimated to be 3.2% while the median loss for vessels with 75% or greater dependence on groundfish was 41.1%. This difference between vessels from lower to higher levels of dependence on groundfish trip income is consistent for all percentiles. As noted above, the revenue impacts for Alternative 1B are lower across all dependence categories.

Alternative 1C and 1D revenue impacts are higher, but not appreciably so, for vessels with groundfish dependence below 75%. Among vessels that are most dependent on groundfish, the revenue impacts for Alternative 1C are 3 to 5 percentage points higher as compared to Alternative 1A with the same used DAS. Similarly, the impacts of Alternative 1D exceed that of 1B particularly among vessels at or below the 10^{th} percentile (i.e. the most affected vessels).

Dependence on Groundfish	Number of Vessels	**Alternative 1A**		**Alternative 1B**		**Alternative 1C**		**Alternative 1D**	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Less than 25% (n = 182)									
10th Percent. and Below	18	Min.	-11.6%	Min.	-10.4%	Min.	-12.2%	Min.	-10.4%
10th to 25th Percent.	27	-11.6%	-8.0%	-10.4%	-5.5%	-12.2%	-8.2%	-10.4%	-5.7%
25th to 50th Percent.	46	-8.0%	-3.2%	-5.5%	-2.1%	-8.2%	-3.6%	-5.7%	-2.5%
50th to 75th Percent.	46	-3.2%	0.0%	-2.1%	0.0%	-3.6%	0.0%	-2.5%	0.0%
75th to 90th Percent.	27	0.0%	0.5%	0.0%	0.6%	0.0%	0.3%	0.0%	0.4%
Above 90th Percent.	18	0.5%	Max.	0.6%	Max.	0.3%	Max.	0.4%	Max.
25 to less than 50% (n = 142)									
10th Percent. and Below	14	Min.	-27.4%	Min.	-22.7%	Min.	-27.4%	Min.	-22.8%
10th to 25th Percent.	21	-27.4%	-20.9%	-22.7%	-15.4%	-27.4%	-21.7%	-22.8%	-16.8%
25th to 50th Percent.	36	-20.9%	-17.1%	-15.4%	-10.9%	-21.7%	-17.8%	-16.8%	-11.8%
50th to 75th Percent.	36	-17.1%	-12.2%	-10.9%	-7.2%	-17.8%	-13.3%	-11.8%	-8.4%
75th to 90th Percent.	21	-12.2%	-2.6%	-7.2%	0.0%	-13.3%	-6.7%	-8.4%	-0.9%
Above 90th Percent.	14	-2.6%	Max.	0.0%	Max.	-6.7%	Max.	-0.9%	Max.
50% to less than 75% (n = 153)									
10th Percent. and Below	15	Min.	-39.6%	Min.	-33.0%	Min.	-40.3%	Min.	-33.2%
10th to 25th Percent.	23	-39.6%	-33.2%	-33.0%	-21.7%	-40.3%	-34.8%	-33.2%	-24.0%
25th to 50th Percent.	38	-33.2%	-28.9%	-21.7%	-17.6%	-34.8%	-29.7%	-24.0%	-19.0%
50th to 75th Percent.	38	-28.9%	-21.3%	-17.6%	-10.8%	-29.7%	-22.7%	-19.0%	-13.7%
75th to 90th Percent.	23	-21.3%	-7.2%	-10.8%	0.0%	-22.7%	-9.5%	-13.7%	-2.6%
Above 90th Percent.	15	-7.2%	Max.	0.0%	Max.	-9.5%	Max.	-2.6%	Max.
75% or Greater (n = 371)									
10th Percent. and Below	37	Min.	-50.0%	Min.	-33.8%	Min.	-54.8%	Min.	-43.6%
10th to 25th Percent.	56	-50.0%	-45.5%	-33.8%	-28.1%	-54.8%	-48.1%	-43.6%	-32.1%
25th to 50th Percent.	93	-45.5%	-41.1%	-28.1%	-24.9%	-48.1%	-43.2%	-32.1%	-27.5%
50th to 75th Percent.	93	-41.1%	-33.3%	-24.9%	-16.4%	-43.2%	-36.1%	-27.5%	-20.9%
75th to 90th Percent.	56	-33.3%	0.0%	-16.4%	5.1%	-36.1%	-8.1%	-20.9%	2.7%
Above 90th Percent.	37	0.0%	Max.	5.1%	Max.	-8.1%	Max.	2.7%	Max.

Table 193 - Revenue Impacts by Dependency on Groundfish for Alternatives 1A, 1B, 1C and 1D

Impact by Entity Size in Terms of Gross Sales

Dependence on groundfish is defined as the proportion of groundfish trip income of total fishing income. This measure does not take into account the level of total fishing income since a vessel with $5,000 in total fishing income could have the same level of dependence on groundfish as a vessel with $500,000 in total fishing income. In relative terms the impact on these two vessels may be the same but the total impact may be very different since the former may have income from other non-fishing sources while for the latter fishing may be the sole source of income and may support a larger number of people. To examine the relative impact on vessels with differing levels of groundfish revenues the estimated distribution of No Action revenues was divided into approximate quartiles resulting in the following revenue classes; $35,000 or less, $35,001 to $100,000, $100,001 to $250,000, and $250,001 or more.

As was the case for groundfish dependence, the relative impact on vessels with higher gross sales was estimated to be greater at all percentiles, although the relative impact for the most affected vessels (the 10th percentile) was approximately the same (-47%) for all sales categories from $35,001 and above (Table 194). Note that the fact that estimated relative revenue losses were generally higher for vessels with higher gross sales also means that the revenue losses in absolute terms would also be greater.

The relative impact on vessels with gross groundfish sales of $35,000 or less was substantially lower than vessels with higher gross sales. In fact, 25% of these vessels were estimated to earn higher fishing income under either Alternative 1A or 1B as compared to No Action. Vessels with increased revenue tended to be smaller vessels using gillnet or hook gear; vessels that would benefit relatively more from the increased GOM cod trip limit and whose revenue would be more sensitive to differences in area closures between No Action and Alternative 1.

Estimated impacts on gross revenues were higher for Alternative 1C and 1D as compared to 1A and 1B but the relative distribution of impacts among sales intervals was similar; with revenue impacts tending to increase with sales.

		Alternative 1A		**Alternative 1B**		**Alternative 1C**		**Alternative 1D**	
Gross Groundfish Sales Intervals	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
$35,000 or less (n = 209)									
10th Percentile and Below	21	Min.	-28.0%	Min.	-19.5%	Min.	-29.2%	Min.	-24.0%
10th to 25th Percentile	31	-28.0%	-11.4%	-19.5%	-7.1%	-29.2%	-13.3%	-24.0%	-10.8%
25th to 50th Percentile	52	-11.4%	-1.2%	-7.1%	0.0%	-13.3%	-2.8%	-10.8%	-1.2%
50th to 75th Percentile	52	-1.2%	0.3%	0.0%	0.6%	-2.8%	0.0%	-1.2%	0.4%
75th to 90th Percentile	31	0.3%	18.9%	0.6%	19.3%	0.0%	18.5%	0.4%	18.9%
Above 90th Percentile	21	18.9%	Max.	19.3%	Max.	18.5%	Max.	18.9%	Max.
$35,001 to $100,000 (n = 245)									
10th Percentile and Below	25	Min.	-46.3%	Min.	-32.4%	Min.	-48.1%	Min.	-33.8%
10th to 25th Percentile	37	-46.3%	-35.2%	-32.4%	-23.2%	-48.1%	-37.2%	-33.8%	-23.9%
25th to 50th Percentile	61	-35.2%	-20.9%	-23.2%	-12.8%	-37.2%	-21.5%	-23.9%	-13.9%
50th to 75th Percentile	61	-20.9%	-8.8%	-12.8%	-2.9%	-21.5%	-9.5%	-13.9%	-5.1%
75th to 90th Percentile	37	-8.8%	-1.0%	-2.9%	2.3%	-9.5%	-2.1%	-5.1%	1.0%
Above 90th Percentile	25	-1.0%	Max.	2.3%	Max.	-2.1%	Max.	1.0%	Max.
$100,001 to $250,000 (n = 197)									
10th Percentile and Below	21	Min.	-47.7%	Min.	-30.2%	Min.	-50.1%	Min.	-38.6%
10th to 25th Percentile	31	-47.7%	-42.8%	-30.2%	-26.6%	-50.1%	-45.4%	-38.6%	-29.4%
25th to 50th Percentile	47	-42.8%	-34.8%	-26.6%	-20.6%	-45.4%	-37.1%	-29.4%	-23.6%
50th to 75th Percentile	47	-34.8%	-21.0%	-20.6%	-11.4%	-37.1%	-23.6%	-23.6%	-14.5%
75th to 90th Percentile	31	-21.0%	-11.0%	-11.4%	-4.7%	-23.6%	-11.2%	-14.5%	-7.0%
Above 90th Percentile	21	-11.0%	Max.	-4.7%	Max.	-11.2%	Max.	-7.0%	Max.

Table 194 - Revenue Impacts by Size of Gross Groundfish Sales for Alternatives 1A, 1B, 1C and 1D

		Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
Gross Groundfish Sales Intervals	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
$250,001 or more (n = 187)									
10th Percentile and Below	19	Min.	-47.1%	Min.	-29.8%	Min.	-50.5%	Min.	-38.6%
10th to 25th Percentile	28	-47.1%	-44.5%	-29.8%	-27.3%	-50.5%	-47.5%	-38.6%	-31.9%
25th to 50th Percentile	47	-44.5%	-39.4%	-27.3%	-24.4%	-47.5%	-42.5%	-31.9%	-27.5%
50th to 75th Percentile	47	-39.4%	-26.7%	-24.4%	-16.7%	-42.5%	-28.0%	-27.5%	-18.4%
75th to 90th Percentile	28	-26.7%	-15.6%	-16.7%	-9.6%	-28.0%	-16.6%	-18.4%	-11.1%
Above 90th Percentile	19	-15.6%	Max.	-9.6%	Max.	-16.6%	Max.	-11.1%	Max.

Table 194 - Revenue Impacts by Size of Gross Groundfish Sales for Alternatives 1A, 1B, 1C and 1D (cont.)

Impact by Gear Groups

The relative revenue impact was lower for hook gear than for either gillnet or trawl gears for both Alternative 1A and 1B (Table 195). Since cod represents a higher proportion of trip income for hook gear than for gillnet or trawl gear, revenue impacts associated with DAS reductions are offset by the higher GOM cod trip limit that for some vessels is enough to result in a net increase in fishing revenue.

Estimated revenue impacts were similar among the most impacted gillnet and trawl vessels but estimated revenue changes tended to be less severe for gillnet vessels above the 25th percentile as compared to the trawl vessels. For example, the revenue impact on the median gillnet vessel was 12.0% as compared to 29.5% for the median trawl vessel. Gillnet impacts tended to be lower than trawl impacts, because like hook gear, cod represents a higher proportion of trip income so gillnet gear tends to benefit proportionally more from a change in cod trip limits than trawl gear. Note that total impact on trawl vessels is not only greater in relative terms but would also be greater in absolute terms since there are more than twice as many trawl vessels than either gillnet or hook vessels.

The more restrictive Georges Bank cod trip limit for Alternative 1C and 1D has only a small impact on trawl vessels compared to Alternatives 1A and 1B but would have a larger impact on both gillnet and hook gears. However, this impact is not uniform for all hook and gillnet vessels. That is, vessels that rely on Gulf of Main stocks would not be affected by a change in Georges Bank cod trip limits whereas, vessels that fish primarily on Georges Bank are more affected.

	Number of Vessels	Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Gillnet Gear (n= 181)									
10th Percentile and Below	18	Min.	-46.6%	Min.	-27.2%	Min.	-51.5%	Min.	-39.4%
10th to 25th Percentile	27	-46.6%	-34.9%	-27.2%	-19.3%	-51.5%	-42.5%	-39.4%	-26.2%
25th to 50th Percentile	45	-34.9%	-12.0%	-19.3%	-2.9%	-42.5%	-14.3%	-26.2%	-7.2%
50th to 75th Percentile	45	-12.0%	0.0%	-2.9%	0.6%	-14.3%	-0.2%	-7.2%	0.3%
75th to 90th Percentile	27	0.0%	11.6%	0.6%	18.5%	-0.2%	11.6%	0.3%	17.1%
Above 90th Percentile	18	11.6%	Max.	18.5%	Max.	11.6%	Max.	17.1%	Max.
Hook Gear (n=75)									
10th Percentile and Below	8	Min.	-37.7%	Min.	-24.3%	Min.	-44.1%	Min.	-31.9%
10th to 25th Percentile	11	-37.7%	-19.9%	-24.3%	-3.1%	-44.1%	-24.0%	-31.9%	-19.3%
25th to 50th Percentile	19	-19.9%	0.0%	-3.1%	0.0%	-24.0%	-7.7%	-19.3%	-3.0%
50th to 75th Percentile	19	0.0%	3.4%	0.0%	3.9%	-7.7%	1.9%	-3.0%	3.6%
75th to 90th Percentile	11	3.4%	29.2%	3.9%	29.2%	1.9%	29.2%	3.6%	29.2%
Above 90th Percentile	8	29.2%	Max.	29.2%	Max.	29.2%	Max.	29.2%	Max.
Trawl Gear (n=592)									
10th Percentile and Below	59	Min.	-46.4%	Min.	-30.6%	Min.	-48.8%	Min.	-33.5%
10th to 25th Percentile	89	-46.4%	-41.4%	-30.6%	-26.4%	-48.8%	-43.0%	-33.5%	-28.5%
25th to 50th Percentile	148	-41.4%	-29.5%	-26.4%	-18.7%	-43.0%	-30.3%	-28.5%	-20.1%
50th to 75th Percentile	148	-29.5%	-14.1%	-18.7%	-9.2%	-30.3%	-14.1%	-20.1%	-9.7%
75th to 90th Percentile	89	-14.1%	-4.7%	-9.2%	-2.7%	-14.1%	-4.7%	-9.7%	-2.8%
Above 90th Percentile	59	-4.7%	Max.	-2.7%	Max.	-4.7%	Max.	-2.8%	Max.

Table 195 - Proportional Change in Gross Annual Revenues by Gear Group for Alternatives 1A, 1B, 1C and 1D

Impact by Vessel Length Class

The estimated relative impact of total annual fishing revenue was lower for vessels under 50-feet for either Alternative 1A or 1B, although the Alternative 1A impact on the most affected small vessels was not substantially less (40.3%) than either medium (46.6%) or large (46.3%) vessels (Table 196). The distribution of revenue impact was similar for both medium and large vessels indicating that neither vessel size class would be disproportionately affected relative to each other under either Alternative 1A or 1B. Since hook and gillnet vessels tend to be small, the economic impacts on small vessels of Alternatives 1C and 1D was proportionally greater than Alternatives 1A and 1B.

	Number of Vessels	Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
Large (n=190)		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
10th Percentile and Below	19	Min.	-46.3%	Min.	-29.0%	Min.	-49.8%	Min.	-33.2%
10th to 25th Percentile	29	-46.3%	-42.3%	-29.0%	-26.2%	-49.8%	-45.2%	-33.2%	-30.1%
25th to 50th Percentile	48	-42.3%	-29.4%	-26.2%	-18.0%	-45.2%	-30.2%	-30.1%	-19.5%
50th to 75th Percentile	48	-29.4%	-14.6%	-18.0%	-9.2%	-30.2%	-15.7%	-19.5%	-10.6%
75th to 90th Percentile	29	-14.6%	-4.4%	-9.2%	-3.3%	-15.7%	-4.4%	-10.6%	-3.3%
Above 90th Percentile	19	-4.4%	Max.	-3.3%	Max.	-4.4%	Max.	-3.3%	Max.
Medium (n=485)									
10th Percentile and Below	49	Min.	-46.6%	Min.	-30.8%	Min.	-48.5%	Min.	-34.4%
10th to 25th Percentile	73	-46.6%	-41.0%	-30.8%	-26.4%	-48.5%	-43.0%	-34.4%	-28.2%
25th to 50th Percentile	121	-41.0%	-29.2%	-26.4%	-18.1%	-43.0%	-30.3%	-28.2%	-20.1%
50th to 75th Percentile	121	-29.2%	-12.8%	-18.1%	-6.1%	-30.3%	-13.5%	-20.1%	-7.2%
75th to 90th Percentile	73	-12.8%	0.0%	-6.1%	0.0%	-13.5%	-0.4%	-7.2%	0.0%
Above 90th Percentile	49	0.0%	Max.	0.0%	Max.	-0.4%	Max.	0.0%	Max.
Small (n=173)									
10th Percentile and Below	17	Min.	-40.3%	Min.	-25.1%	Min.	-44.7%	Min.	-30.6%
10th to 25th Percentile	26	-40.3%	-21.3%	-25.1%	-11.4%	-44.7%	-24.0%	-30.6%	-18.3%
25th to 50th Percentile	43	-21.3%	-5.5%	-11.4%	-0.3%	-24.0%	-9.2%	-18.3%	-4.2%
50th to 75th Percentile	43	-5.5%	0.0%	-0.3%	1.0%	-9.2%	0.0%	-4.2%	0.5%
75th to 90th Percentile	26	0.0%	19.3%	1.0%	23.7%	0.0%	18.5%	0.5%	23.7%
Above 90th Percentile	17	19.3%	Max.	23.7%	Max.	18.5%	Max.	23.7%	Max.

Table 196 - Proportional Change in Gross Annual Revenues by Vessel Size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternatives 1A, 1B, 1C, and 1D

Impact by Gear/Length Groups

The relative revenue impact for small hook vessels was less than that of larger hook vessels, although not substantially so (Table 197). Unlike hook gear, small gillnet vessels were less affected than larger gillnet vessels but there was a greater difference in revenue impact with larger gillnet vessels being substantially more impacted at all percentiles than small gillnet vessels. For trawl gear, the distribution of revenue impacts was similar across all size classes at least up to the 50^{th} percentile. Above the 50^{th} percentile small vessels tended to be proportionally less affected than either medium or large vessels and large vessels tended to be less impacted than medium vessels. As noted previously, due to the lower DAS reductions the revenue impacts for Alternative 1B were lower across all gear and size groupings than that of Alternative 1A.

	Number of Vessels	Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
Small Hook (n=51)		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
10th Percentile and Below	5	Min.	-34.1%	Min.	-24.3%	Min.	-44.1%	Min.	-35.6%
10th to 25th Percentile	8	-34.1%	-19.5%	-24.3%	-2.8%	-44.1%	-24.0%	-35.6%	-21.3%
25th to 50th Percentile	13	-19.5%	0.0%	-2.8%	0.0%	-24.0%	-9.4%	-21.3%	-7.7%
50th to 75th Percentile	13	0.0%	3.4%	0.0%	3.6%	-9.4%	1.9%	-7.7%	3.2%
75th to 90th Percentile	8	3.4%	29.2%	3.6%	29.2%	1.9%	29.2%	3.2%	29.2%
Above 90th Percentile	5	29.2%	Max.	29.2%	Max.	29.2%	Max.	29.2%	Max.
Large Hook (n=24)									
10th Percentile and Below	2	Min.	-37.7%	Min.	-23.5%	Min.	-37.9%	Min.	-24.1%
10th to 25th Percentile	4	-37.7%	-25.6%	-23.5%	-6.1%	-37.9%	-26.6%	-24.1%	-12.7%
25th to 50th Percentile	6	-25.6%	0.0%	-6.1%	0.0%	-26.6%	-1.3%	-12.7%	0.0%
50th to 75th Percentile	6	0.0%	3.9%	0.0%	5.6%	-1.3%	3.8%	0.0%	5.6%
75th to 90th Percentile	4	3.9%	20.3%	5.6%	20.3%	3.8%	20.3%	5.6%	20.3%
Above 90th Percentile	2	20.3%	Max.	20.3%	Max.	20.3%	Max.	20.3%	Max.
Small Trawl (n=187)									
10th Percentile and Below	19	Min.	-47.0%	Min.	-31.5%	Min.	-47.1%	Min.	-32.0%
10th to 25th Percentile	28	-47.0%	-38.9%	-31.5%	-26.1%	-47.1%	-39.7%	-32.0%	-26.3%
25th to 50th Percentile	47	-38.9%	-24.8%	-26.1%	-14.8%	-39.7%	-25.3%	-26.3%	-14.8%
50th to 75th Percentile	47	-24.8%	-9.1%	-14.8%	-4.6%	-25.3%	-9.1%	-14.8%	-4.7%
75th to 90th Percentile	28	-9.1%	-1.0%	-4.6%	0.0%	-9.1%	-1.0%	-4.7%	0.0%
Above 90th Percentile	19	-1.0%	Max.	0.0%	Max.	-1.0%	Max.	0.0%	Max.
Medium Trawl (n=218)									
10th Percentile and Below	22	Min.	-46.6%	Min.	-32.8%	Min.	-48.8%	Min.	-33.7%
10th to 25th Percentile	33	-46.6%	-41.9%	-32.8%	-26.9%	-48.8%	-43.1%	-33.7%	-28.4%
25th to 50th Percentile	55	-41.9%	-32.1%	-26.9%	-21.6%	-43.1%	-33.8%	-28.4%	-22.6%
50th to 75th Percentile	55	-32.1%	-19.0%	-21.6%	-12.8%	-33.8%	-19.3%	-22.6%	-13.4%
75th to 90th Percentile	33	-19.0%	-10.2%	-12.8%	-6.2%	-19.3%	-10.2%	-13.4%	-6.3%
Above 90th Percentile	22	-10.2%	Max.	-6.2%	Max.	-10.2%	Max.	-6.3%	Max.
Large Trawl (n=187)									
10th Percentile and Below	19	Min.	-46.4%	Min.	-29.1%	Min.	-49.9%	Min.	-33.4%
10th to 25th Percentile	28	-46.4%	-42.3%	-29.1%	-26.2%	-49.9%	-45.2%	-33.4%	-30.1%
25th to 50th Percentile	47	-42.3%	-29.3%	-26.2%	-18.0%	-45.2%	-30.3%	-30.1%	-19.9%
50th to 75th Percentile	47	-29.3%	-14.6%	-18.0%	-9.2%	-30.3%	-15.7%	-19.9%	-10.6%
75th to 90th Percentile	28	-14.6%	-4.4%	-9.2%	-3.3%	-15.7%	-4.4%	-10.6%	-3.3%
Above 90th Percentile	19	-4.4%	Max.	-3.3%	Max.	-4.4%	Max.	-3.3%	Max.

Table 197 - Proportional Change in Gross Annual Revenues by Gear Group and Vessel Size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternatives 1A, 1B, 1C, and 1D

	Number of Vessels	Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Small Gillnet (n=63)									
10th Percentile and Below	6	Min.	-40.3%	Min.	-23.4%	Min.	-51.9%	Min.	-38.5%
10th to 25th Percentile	9	-40.3%	-17.7%	-23.4%	-4.1%	-51.9%	-19.0%	-38.5%	-13.1%
25th to 50th Percentile	16	-17.7%	-2.6%	-4.1%	0.0%	-19.0%	-2.9%	-13.1%	0.0%
50th to 75th Percentile	16	-2.6%	9.3%	0.0%	12.7%	-2.9%	9.3%	0.0%	12.3%
75th to 90th Percentile	9	9.3%	29.7%	12.7%	29.7%	9.3%	29.7%	12.3%	29.7%
Above 90th Percentile	6	29.7%	Max.	29.7%	Max.	29.7%	Max.	29.7%	Max.
Medium Gillnet (n=118)									
10th Percentile and Below	12	Min.	-47.8%	Min.	-27.7%	Min.	-51.5%	Min.	-43.2%
10th to 25th Percentile	18	-47.8%	-39.8%	-27.7%	-21.6%	-51.5%	-46.1%	-43.2%	-28.4%
25th to 50th Percentile	30	-39.8%	-18.8%	-21.6%	-10.2%	-46.1%	-24.3%	-28.4%	-14.3%
50th to 75th Percentile	30	-18.8%	-1.5%	-10.2%	0.0%	-24.3%	-4.0%	-14.3%	-0.2%
75th to 90th Percentile	18	-1.5%	1.7%	0.0%	4.6%	-4.0%	0.5%	-0.2%	3.2%
Above 90th Percentile	12	1.7%	Max.	4.6%	Max.	0.5%	Max.	3.2%	Max.

Table 197 - Proportional Change in Gross Annual Revenues by Gear Group and Vessel Size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternatives 1A, 1B, 1C, and 1D

Impacts by Home Port State

Alternative 1A would have greatest revenue impact on vessels from Maine home ports as compared to other states (Table 198). The distribution of revenue impacts was similar across all states except for New Jersey at the 10^{th} percentile ranging from a loss of 42.8% in Rhode Island to 47.8% in Massachusetts. At the 25^{th} percentile, Maine and Massachusetts's vessel revenue reductions were higher than all other states at 42.5% and 42.4% respectively. However, at higher percentiles Maine vessels were estimated to experience higher revenue impacts than any other state at both the 50^{th} and 75^{th} percentiles.

Across all states, only New Jersey and Rhode Island (and quite likely New York vessels) did not have any vessels with unchanged or increased fishing revenues under Alternative 1A. Vessels from these states are most likely to fish on Georges Bank or Southern New England and so would not be likely to benefit from an increase in the GOM cod trip limit.

Home Port State	Number of Vessels	Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Massachusetts (n=396)									
10th Percent./below	40	Min.	-47.8%	Min.	-29.8%	Min.	-51.3%	Min.	-38.1%
10th to 25th Percentile	59	-47.8%	-42.4%	-29.8%	-26.0%	-51.3%	-45.7%	-38.1%	-30.0%
25th to 50th Percentile	99	-42.4%	-29.7%	-26.0%	-17.3%	-45.7%	-32.4%	-30.0%	-21.1%
50th to 75th Percentile	99	-29.7%	-8.0%	-17.3%	-1.9%	-32.4%	-11.5%	-21.1%	-6.6%
75th to 90th Percentile	59	-8.0%	1.2%	-1.9%	3.6%	-11.5%	0.2%	-6.6%	2.6%
Above 90th Percentile	40	1.2%	Max.	3.6%	Max.	0.2%	Max.	2.6%	Max.
Maine (n=131)									
10th Percent./below	13	Min.	-45.9%	Min.	-28.2%	Min.	-47.5%	Min.	-29.4%
10th to 25th Percentile	20	-45.9%	-42.5%	-28.2%	-26.3%	-47.5%	-43.4%	-29.4%	-26.6%
25th to 50th Percentile	33	-42.5%	-36.1%	-26.3%	-21.8%	-43.4%	-36.1%	-26.6%	-21.9%
50th to 75th Percentile	33	-36.1%	-10.5%	-21.8%	-3.6%	-36.1%	-10.5%	-21.9%	-3.8%
75th to 90th Percentile	20	-10.5%	0.0%	-3.6%	0.0%	-10.5%	0.0%	-3.8%	0.0%
Above 90th Percentile	13	0.0%	Max.	0.0%	Max.	0.0%	Max.	0.0%	Max.
New Hampshire (n=60)									
10th Percent./below	6	Min.	-47.2%	Min.	-30.2%	Min.	-48.0%	Min.	-30.6%
10th to 25th Percentile	9	-47.2%	-38.2%	-30.2%	-24.5%	-48.0%	-41.0%	-30.6%	-26.7%
25th to 50th Percentile	15	-38.2%	-18.6%	-24.5%	-14.1%	-41.0%	-19.0%	-26.7%	-17.6%
50th to 75th Percentile	15	-18.6%	-5.2%	-14.1%	3.6%	-19.0%	-5.2%	-17.6%	3.6%
75th to 90th Percentile	9	-5.2%	25.2%	3.6%	25.2%	-5.2%	22.5%	3.6%	24.9%
Above 90th Percentile	6	25.2%	Max.	25.2%	Max.	22.5%	Max.	24.9%	Max.
New Jersey (n=45)									
10th Percent./below	5	Min.	-26.4%	Min.	-21.1%	Min.	-27.9%	Min.	-21.1%
10th to 25th Percentile	7	-26.4%	-19.0%	-21.1%	-14.3%	-27.9%	-19.7%	-21.1%	-14.5%
25th to 50th Percentile	11	-19.0%	-13.5%	-14.3%	-9.2%	-19.7%	-14.1%	-14.5%	-9.5%
50th to 75th Percentile	11	-13.5%	-6.1%	-9.2%	-3.5%	-14.1%	-6.1%	-9.5%	-5.7%
75th to 90th Percentile	7	-6.1%	-1.9%	-3.5%	0.0%	-6.1%	-1.9%	-5.7%	-1.9%
Above 90th Percentile	5	-1.9%	Max.	0.0%	Max.	-1.9%	Max.	-1.9%	Max.
New York/Connecticut (n = 95)									
10th Percent./below	10	Min.	-46.3%	Min.	-35.4%	Min.	-48.1%	Min.	-35.6%
10th to 25th Percentile	14	-46.3%	-31.9%	-35.4%	-25.1%	-48.1%	-34.0%	-35.6%	-26.7%
25th to 50th Percentile	24	-31.9%	-17.6%	-25.1%	-13.6%	-34.0%	-17.6%	-26.7%	-13.6%
50th to 75th Percentile	24	-17.6%	-6.1%	-13.6%	-3.7%	-17.6%	-6.1%	-13.6%	-4.0%
75th to 90th Percentile	14	-6.1%	0.0%	-3.7%	0.0%	-6.1%	-0.1%	-4.0%	0.0%
Above 90th Percentile	10	0.0%	Max.	0.0%	Max.	-0.1%	Max.	0.0%	Max.

Table 198 - Proportional Change in Gross Revenue by Home Port State for Alternatives 1A, 1B, 1C, and 1D

Home Port State	Number of Vessels	Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Rhode Island (n=96)									
10th Percent./below	10	Min.	-42.8%	Min.	-33.7%	Min.	-43.1%	Min.	-35.2%
10th to 25th Percentile	14	-42.8%	-34.1%	-33.7%	-23.6%	-43.1%	-35.2%	-35.2%	-26.8%
25th to 50th Percentile	24	-34.1%	-19.8%	-23.6%	-13.2%	-35.2%	-21.1%	-26.8%	-14.7%
50th to 75th Percentile	24	-19.8%	-9.6%	-13.2%	-6.7%	-21.1%	-9.8%	-14.7%	-7.3%
75th to 90th Percentile	14	-9.6%	-3.1%	-6.7%	0.0%	-9.8%	-3.1%	-7.3%	0.0%
Above 90th Percentile	10	-3.1%	Max.	0.0%	Max.	-3.1%	Max.	0.0%	Max.
All Other (n=25)									
10th Percent./below	3	Min.	-39.1%	Min.	-24.8%	Min.	-44.0%	Min.	-30.5%
10th to 25th Percentile	4	-39.1%	-16.7%	-24.8%	-10.3%	-44.0%	-17.8%	-30.5%	-11.1%
25th to 50th Percentile	6	-16.7%	-8.8%	-10.3%	-5.5%	-17.8%	-8.8%	-11.1%	-5.6%
50th to 75th Percentile	6	-8.8%	-4.3%	-5.5%	-2.7%	-8.8%	-4.4%	-5.6%	-2.8%
75th to 90th Percentile	4	-4.3%	0.0%	-2.7%	0.0%	-4.4%	0.0%	-2.8%	0.0%
Above 90th Percentile	3	0.0%	Max.	0.0%	Max.	0.0%	Max.	0.0%	Max.

Table 198 - Proportional Change in Gross Revenue by Home Port State for Alternatives 1A, 1B, 1C, and 1D

Impacts by Port Groups

Across port groups the relative distribution of estimated revenue impacts was similar at and below the 25th percentile for the port groups of Boston, Gloucester, New Bedford, Portland, Portsmouth, and Upper Mid-Coast, Maine (Table 199). For these ports and port groups, the revenue impact on the most affected vessels ranged from -43.0% in Boston to -45.9% in Portland. Revenue losses at the 50th percentile ranged from nearly 30% in Portsmouth to 43.6% in Portland. Overall, Portland, Maine had the highest revenue reduction at the 25th, 50th, and 75th percentile. However, even though Portland vessels would be disproportionately affected, the total impact on the ports of New Bedford and Gloucester would likely be greater because the number of vessels operating out of these ports is greater. Among other ports the groups including Point Judith, Provincetown, and South Shore Massachusetts all had roughly equivalent revenue impacts across all percentiles.

Revenue impacts on home port vessels in states with proportionally more vessels that rely on Georges Bank cod would be comparatively more affected under Alternative 1C and 1D as compared to 1A and 1B than vessels from states that have greater reliance on Gulf of Maine stocks.

As noted previously, revenue impacts of Alternatives 1C and 1D are larger for vessels that fish predominantly on Georges Bank and Georges Bank cod in particular. This is particularly notable for the Chatham/Harwich port group that is home to a concentration of hook and gillnet vessels.

Port Group	Number of Vessels	Alternative 1A		Alternative 1B		Alternative 1C		Alternative 1D	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Boston (n=20)									
25th Percent./below	5	Min.	-43.0%	Min.	-26.2%	Min.	-45.7%	Min.	-31.3%
25th to 50th Percentile	5	-43.0%	-38.6%	-26.2%	-23.8%	-45.7%	-40.6%	-31.3%	-26.7%
50th to 75th Percentile	5	-38.6%	-15.5%	-23.8%	-7.6%	-40.6%	-14.6%	-26.7%	-8.4%
Above 75th Percentile	5	-15.5%	Max.	-7.6%	Max.	-14.6%	Max.	-8.4%	Max.
Chatham/Harwich (n=50)									
25th Percent./below	13	Min.	-42.9%	Min.	-24.3%	Min.	-51.5%	Min.	-43.6%
25th to 50th Percentile	13	-42.9%	-28.8%	-24.3%	-8.3%	-51.5%	-37.0%	-43.6%	-25.9%
50th to 75th Percentile	13	-28.8%	0.0%	-8.3%	0.0%	-37.0%	-18.3%	-25.9%	-13.2%
Above 75th Percentile	13	0.0%	Max.	0.0%	Max.	-18.3%	Max.	-13.2%	Max.
Eastern Long Island (n=40)									
25th Percent./below	10	Min.	-22.5%	Min.	-17.9%	Min.	-22.7%	Min.	-18.4%
25th to 50th Percentile	10	-22.5%	-14.2%	-17.9%	-11.6%	-22.7%	-14.2%	-18.4%	-12.5%
50th to 75th Percentile	10	-14.2%	-3.6%	-11.6%	-3.5%	-14.2%	-3.8%	-12.5%	-3.7%
Above 75th Percentile	10	-3.6%	Max.	-3.5%	Max.	-3.8%	Max.	-3.7%	Max.
Gloucester (n=97)									
25th Percent./below	24	Min.	-44.7%	Min.	-28.1%	Min.	-47.7%	Min.	-30.2%
25th to 50th Percentile	24	-44.7%	-36.2%	-28.1%	-18.5%	-47.7%	-39.4%	-30.2%	-20.9%
50th to 75th Percentile	24	-36.2%	-4.7%	-18.5%	0.1%	-39.4%	-5.5%	-20.9%	-1.3%
Above 75th Percentile	24	-4.7%	Max.	0.1%	Max.	-5.5%	Max.	-1.3%	Max.
New Bedford (n=96)									
25th Percent./below	24	Min.	-43.9%	Min.	-27.0%	Min.	-47.0%	Min.	-31.0%
25th to 50th Percentile	24	-43.9%	-39.6%	-27.0%	-24.4%	-47.0%	-42.3%	-31.0%	-27.5%
50th to 75th Percentile	24	-39.6%	-28.6%	-24.4%	-19.2%	-42.3%	-29.7%	-27.5%	-20.3%
Above 75th Percentile	24	-28.6%	Max.	-19.2%	Max.	-29.7%	Max.	-20.3%	Max.
New Hampshire Seacoast (n=32)									
25th Percent./below	8	Min.	-30.5%	Min.	-22.7%	Min.	-32.7%	Min.	-24.0%
25th to 50th Percentile	8	-30.5%	-13.4%	-22.7%	-9.6%	-32.7%	-13.4%	-24.0%	-10.2%
50th to 75th Percentile	8	-13.4%	2.4%	-9.6%	11.8%	-13.4%	2.4%	-10.2%	11.8%
Above 75th Percentile	8	2.4%	Max.	11.8%	Max.	2.4%	Max.	11.8%	Max.
Point Judith (n=49)									
25th Percent./below	12	Min.	-39.1%	Min.	-30.3%	Min.	-39.4%	Min.	-30.3%
25th to 50th Percentile	12	-39.1%	-22.4%	-30.3%	-13.7%	-39.4%	-24.8%	-30.3%	-16.8%
50th to 75th Percentile	12	-22.4%	-13.7%	-13.7%	-9.4%	-24.8%	-13.7%	-16.8%	-10.3%
Above 75th Percentile	12	-13.7%	Max.	-9.4%	Max.	-13.7%	Max.	-10.3%	Max.
Portland (n=39)									
25th Percent./below	10	Min.	-45.9%	Min.	-28.2%	Min.	-48.0%	Min.	-31.7%
25th to 50th Percentile	10	-45.9%	-43.6%	-28.2%	-26.5%	-48.0%	-44.4%	-31.7%	-27.4%
50th to 75th Percentile	10	-43.6%	-36.9%	-26.5%	-22.2%	-44.4%	-37.8%	-27.4%	-22.7%
Above 75th Percentile	10	-36.9%	Max.	-22.2%	Max.	-37.8%	Max.	-22.7%	Max.

Table 199 - Proportional Change in Gross Annual Revenues by Port Group for Alternatives 1A, 1B, 1C, and 1D

Port Group	Number of Vessels	**Alternative 1A**		**Alternative 1B**		**Alternative 1C**		**Alternative 1D**	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Portsmouth (n=26)									
25th Percent./below	7	Min.	-43.7%	Min.	-24.5%	Min.	-46.2%	Min.	-27.6%
25th to 50th Percentile	7	-43.7%	-29.9%	-24.5%	-19.6%	-46.2%	-31.8%	-27.6%	-20.4%
50th to 75th Percentile	7	-29.9%	-16.2%	-19.6%	-3.2%	-31.8%	-16.8%	-20.4%	-8.2%
Above 75th Percentile	7	-16.2%	Max.	-3.2%	Max.	-16.8%	Max.	-8.2%	Max.
Provincetown (n=19)									
25th Percent./below	5	Min.	-34.5%	Min.	-19.8%	Min.	-35.2%	Min.	-21.7%
25th to 50th Percentile	5	-34.5%	-23.5%	-19.8%	-13.0%	-35.2%	-25.6%	-21.7%	-13.7%
50th to 75th Percentile	5	-23.5%	-16.4%	-13.0%	-7.2%	-25.6%	-19.8%	-13.7%	-10.1%
Above 75th Percentile	5	-16.4%	Max.	-7.2%	Max.	-19.8%	Max.	-10.1%	Max.
South Shore Massachusetts (n=37)									
25th Percent./below	9	Min.	-36.3%	Min.	-22.6%	Min.	-36.9%	Min.	-23.6%
25th to 50th Percentile	9	-36.3%	-19.7%	-22.6%	-9.6%	-36.9%	-21.7%	-23.6%	-11.4%
50th to 75th Percentile	9	-19.7%	5.1%	-9.6%	5.1%	-21.7%	0.3%	-11.4%	0.3%
Above 75th Percentile	9	5.1%	Max.	5.1%	Max.	0.3%	Max.	0.3%	Max.
Upper Mid-Coast Maine (n=19)									
25th Percent./below	5	Min.	-43.1%	Min.	-26.4%	Min.	-43.1%	Min.	-26.8%
25th to 50th Percentile	5	-43.1%	-38.3%	-26.4%	-24.1%	-43.1%	-39.3%	-26.8%	-24.5%
50th to 75th Percentile	5	-38.3%	-30.2%	-24.1%	-19.1%	-39.3%	-30.7%	-24.5%	-20.5%
Above 75th Percentile	5	-30.2%	Max.	-19.1%	Max.	-30.7%	Max.	-20.5%	Max.
Other (n=325)									
25th Percent./below	81	Min.	-29.9%	Min.	-19.3%	Min.	-31.1%	Min.	-21.1%
25th to 50th Percentile	81	-29.9%	-15.4%	-19.3%	-10.0%	-31.1%	-16.4%	-21.1%	-10.7%
50th to 75th Percentile	81	-15.4%	-4.3%	-10.0%	-1.7%	-16.4%	-4.4%	-10.7%	-2.3%
Above 75th Percentile	81	-4.3%	Max.	-1.7%	Max.	-4.4%	Max.	-2.3%	Max.

Table 199 - Proportional Change in Gross Annual Revenues by Port Group for Alternatives 1A, 1B, 1C, and 1D (cont.)

5.4.4.3 Impacts on Vessel Fishing Revenue of Alternative 2

Alternative 2 would implement a suite of measures that would require a number of gear changes over and above what current regulations require. Alternative 2 would also implement a set of area closures that differ from no action and differ from that of Alternative 1. The DAS would be similar to current regulations (under the FW 33 court order) except that under Alternative 2A vessels that fished in the GOM would take a 30% reduction in DAS instead of 20% while Alternative 2B would result in the same proportional DAS reduction for all vessels but would restrict the total number of DAS that could be fished in the GOM to 70% of allocated DAS. In all other respects there are no differences between 2A and 2B.

In addition to DAS and area controls Alternative 2 has a number of proposed gear restrictions that have been designed to reduce fishing mortality to desired levels. Alternative 2 also includes a hard TAC as a backstop measure in case any one of the other effort reduction measures are not as effective as anticipated. The analysis presented below reports the impacts of fishing revenues for Alternative 2 with and without the TAC backstop. In this manner, the economic impact of the management measures modeled in the Closed Area Model can be contrasted with that of the TAC backstop. The Closed Area Model, however, does not include the impacts of some of the gear changes (haddock separator trawl, raised footrope trawl, mesh changes, etc). If these measures are as effective as expected, the revenue impacts would be more severe than those shown here for the alternative without the hard TAC. Nevertheless, removing the hard TAC from Alternative 2A and 2B and showing the economic impacts does demonstrate that these two alternatives may have slightly different distributive economic impacts.

Alternative 2B provides some flexibility to vessels to fish outside the GOM rather than be subject to a different DAS reduction. Because of this flexibility, the estimated gross revenue loss (Table 200) for Alternative 2B ($30.2 million) was slightly less than that of 2A ($31.6 million). This difference may be underestimated because the area closure model imposes constraints on fishing location decisions that are consistent with recent fishing history. This means that a vessel that never fished outside the GOM under the no action would not choose to do so under Amendment 13 even though it may be advantageous. Given this limitation, the revenue impacts of Alternative 2B may be overestimated relative to Alternative 2A which would tend to obscure the difference in relative economic effect between the two ways of administering DAS controls in the GOM.

As modeled, Alternative 2 does not meet conservation objectives without the hard TAC backstop. With a hard TAC, the added flexibility offered by the different DAS management options under Alternative 2A and 2B is eliminated because the hard TAC becomes more constraining than DAS allocations. This means that the estimated economic effects of the hard TAC backstop were the same regardless of the proposed DAS administration under Alternative 2A or 2B. The total impact on gross revenues was estimated to be $64.2 million. Note that this impact may be overestimated because the effectiveness of the gear changes could not be quantified. Should the gear changes be as effective as anticipated, or more so, then the hard TAC may not be constraining or would at least not be as constraining as predicted. Nevertheless, even though the economic impact would likely be lower it would probably still be greater than that estimated for Alternative 2A and 2B without the hard TAC backstop since that analysis underestimates revenue impacts because assumed catch rates, hence fishing revenue, would be overestimated.

At the vessel-level the estimated revenue impacts of Alternative 2 with the hard TAC were higher by about 30% at the 10th and 25th percentile. The difference in impact at the median was not quite as high but was still higher by 23% (-37.1% for Alternative 2 with a hard TAC as compared to -13.8% for Alternative 2 without a TAC backstop).

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
10th Percentile and Below	85	Minimum	-38.8%	Minimum	-40.9%	Minimum	-69.4%
10th to 25th Percentile	127	-38.8%	-26.1%	-40.9%	-26.0%	-69.4%	-55.2%
25th to 50th Percentile	212	-26.1%	-13.6%	-26.0%	-13.8%	-55.2%	-37.1%
50th to 75th Percentile	212	-13.6%	-2.3%	-13.8%	-2.5%	-37.1%	-14.4%
75th to 90th Percentile	127	-2.3%	0.5%	-2.5%	0.4%	-14.4%	-4.6%
Above 90th Percentile	85	0.5%	Maximum	0.4%	Maximum	-4.6%	Maximum

Table 200 - Fleet-wide Impacts of Alternative 2A and 2B, both with and without hard TAC

Impact by Dependence on Groundfish
Without the TAC backstop the impact on annual estimated gross fishing revenue increased as dependence on groundfish revenue increased (Table 201). The median loss for vessels that rely on groundfish was less than 1% but was almost 25% for vessels with 75% or greater reliance on groundfish. Among those most dependent on groundfish, estimated revenue loss was 63% or more for 37 of 371 vessels.

For some vessels the estimated revenue change was positive suggesting some vessels would see modest improvements in total fishing revenues under Alternative 2. Such an increase in gross revenue results relative to the Status Quo because of the increase in the GOM cod trip limit as well as some differences in area closures. Note that positive changes in revenues tend to be associated with vessels that are less dependent on groundfish.

With the hard TAC backstop the estimated revenue impacts for vessels least dependent on groundfish would be higher but not by more than 6% at any given percentile. However, for vessels with greater dependence on groundfish for total fishing revenue the estimated impact of the hard TAC backstop was much greater particularly among the most affected vessels (i.e. at the 10^{th} percentile). For example, the impact on gross revenues for vessels that depend on groundfish for 25 to 50% of revenue would be almost -33% with a hard TAC as compared to about -20% without a TAC backstop.

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Dependence on Groundfish	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
Less than 25% (n = 182)							
10th Percentile and Below	18	Minimum	-8.2%	Minimum	-8.2%	Minimum	-14.2%
10th to 25th Percentile	27	-8.2%	-3.9%	-8.2%	-4.1%	-14.2%	-9.8%
25th to 50th Percentile	46	-3.9%	-0.9%	-4.1%	-1.0%	-9.8%	-5.8%
50th to 75th Percentile	46	-0.9%	0.0%	-1.0%	0.0%	-5.8%	-1.9%
75th to 90th Percentile	27	0.0%	1.2%	0.0%	1.2%	-1.9%	-0.1%
Above 90th Percentile	18	1.2%	Maximum	1.2%	Maximum	-0.1%	Maximum
25 to less than 50% (n = 142)							
10th Percentile and Below	14	Minimum	-19.5%	Minimum	-19.5%	Minimum	-32.7%
10th to 25th Percentile	21	-19.5%	-12.0%	-19.5%	-12.0%	-32.7%	-27.2%
25th to 50th Percentile	36	-12.0%	-5.6%	-12.0%	-5.5%	-27.2%	-19.4%
50th to 75th Percentile	36	-5.6%	-0.1%	-5.5%	-0.1%	-19.4%	-13.5%
75th to 90th Percentile	21	-0.1%	1.6%	-0.1%	2.1%	-13.5%	-9.5%
Above 90th Percentile	14	1.6%	Maximum	2.1%	Maximum	-9.5%	Maximum
50% to less than 75% (n = 153)							
10th Percentile and Below	15	Minimum	-37.4%	Minimum	-37.4%	Minimum	-56.9%
10th to 25th Percentile	23	-37.4%	-24.6%	-37.4%	-25.6%	-56.9%	-47.0%
25th to 50th Percentile	38	-24.6%	-14.6%	-25.6%	-14.6%	-47.0%	-38.6%
50th to 75th Percentile	38	-14.6%	-6.5%	-14.6%	-8.3%	-38.6%	-31.2%
75th to 90th Percentile	23	-6.5%	-1.9%	-8.3%	-2.0%	-31.2%	-21.6%
Above 90th Percentile	15	-1.9%	Maximum	-2.0%	Maximum	-21.6%	Maximum
75% or Greater (n = 371)							
10th Percentile and Below	37	Minimum	-62.6%	Minimum	-62.6%	Minimum	-77.7%
10th to 25th Percentile	56	-62.6%	-34.0%	-62.6%	-34.5%	-77.7%	-66.9%
25th to 50th Percentile	93	-34.0%	-24.5%	-34.5%	-24.8%	-66.9%	-56.1%
50th to 75th Percentile	93	-24.5%	-18.1%	-24.8%	-17.3%	-56.1%	-46.4%
75th to 90th Percentile	56	-18.1%	-6.6%	-17.3%	-7.1%	-46.4%	-35.6%
Above 90th Percentile	37	-6.6%	Maximum	-7.1%	Maximum	-35.6%	Maximum

Table 201 - Revenue impacts by dependency on groundfish for Alternative 2A and 2B

Impact by Entity Size in Terms of Gross Sales

The estimated impact of Alternative 2 without the TAC backstop was generally less for vessels with gross sales of $35,000 or less (Table 202). Across all categories of gross sales the largest reduction in gross revenue was 50.9% or greater for vessels with gross sales between $100 and $250 thousand. However, at the 25th and 50th percentile revenue impacts within this sales category were similar to that of vessels with sales of between $35 and $100 thousand and to vessels with sales in excess of $250 thousand. Above the 50th percentile the proportional change in revenue impacts was greatest for vessels with gross sales above $250 thousand.

With a hard TAC backstop the estimated revenue impacts were larger across all categories of gross sales at all percentiles with revenue reductions at the 10th percentile of 70% or more for vessels with gross sales of $35 thousand to $250,000. Estimated impact on the median vessel was highest (-49.9%) for vessels with gross sales of more than $250 thousand and lowest (-12.9%) for vessels with $35 thousand or less in gross sales.

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Gross Groundfish Sales Intervals	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
$35,000 or less (n = 209)							
10th Percentile and Below	21	Minimum	-37.7%	Minimum	-37.7%	Minimum	-63.8%
10th to 25th Percentile	31	-37.7%	-14.3%	-37.7%	-13.5%	-63.8%	-39.5%
25th to 50th Percentile	52	-14.3%	-0.8%	-13.5%	-0.8%	-39.5%	-12.9%
50th to 75th Percentile	52	-0.8%	0.2%	-0.8%	0.2%	-12.9%	-3.5%
75th to 90th Percentile	31	0.2%	4.2%	0.2%	4.2%	-3.5%	-0.5%
Above 90th Percentile	21	4.2%	Maximum	4.2%	Maximum	-0.5%	Maximum
$35,001 to $100,000 (n = 245)							
10th Percentile and Below	25	Minimum	-43.7%	Minimum	-49.1%	Minimum	-72.5%
10th to 25th Percentile	37	-43.7%	-26.9%	-49.1%	-29.2%	-72.5%	-54.7%
25th to 50th Percentile	61	-26.9%	-11.7%	-29.2%	-12.9%	-54.7%	-37.2%
50th to 75th Percentile	61	-11.7%	-3.7%	-12.9%	-3.9%	-37.2%	-17.0%
75th to 90th Percentile	37	-3.7%	0.0%	-3.9%	-0.1%	-17.0%	-8.0%
Above 90th Percentile	25	0.0%	Maximum	-0.1%	Maximum	-8.0%	Maximum
$100,001 to $250,000 (n = 197)							
10th Percentile and Below	21	Minimum	-50.9%	Minimum	-50.0%	Minimum	-70.3%
10th to 25th Percentile	31	-50.9%	-26.4%	-50.0%	-30.8%	-70.3%	-54.9%
25th to 50th Percentile	47	-26.4%	-17.2%	-30.8%	-17.6%	-54.9%	-42.4%
50th to 75th Percentile	47	-17.2%	-6.5%	-17.6%	-6.5%	-42.4%	-27.4%
75th to 90th Percentile	31	-6.5%	-0.9%	-6.5%	-0.7%	-27.4%	-12.1%
Above 90th Percentile	21	-0.9%	Maximum	-0.7%	Maximum	-12.1%	Maximum
$250,001 or more (n = 187)							
10th Percentile and Below	19	Minimum	-34.5%	Minimum	-30.9%	Minimum	-66.1%
10th to 25th Percentile	28	-34.5%	-29.7%	-30.9%	-25.8%	-66.1%	-59.0%
25th to 50th Percentile	47	-29.7%	-22.8%	-25.8%	-20.1%	-59.0%	-49.9%
50th to 75th Percentile	47	-22.8%	-12.4%	-20.1%	-11.8%	-49.9%	-30.5%
75th to 90th Percentile	28	-12.4%	-4.8%	-11.8%	-2.8%	-30.5%	-11.9%
Above 90th Percentile	19	-4.8%	Maximum	-2.8%	Maximum	-11.9%	Maximum

Table 202 - Revenue impacts by gross sales of groundfish for Alternative 2A and 2B

5.4.4.3.1 Impact by Gear Groups

Alternative 2 contains a modest increase in the GOM cod trip limit compared to what had been implemented during FY2001. However, Alternative 2 has a trip limit on GB cod that is much lower than that of the Status Quo which means that vessels that depend on GB cod for the majority of fishing revenue would be significantly affected under this particular Alternative. The difference in cod trip limits between GOM and GB is evident in the estimated revenue impacts of both gillnet and hook gear. Without a hard TAC backstop the revenue impacts for these two sectors show markedly different effects depending upon whether a vessel might fish in the GOM or GB as estimated revenue losses for gillnet vessels ranged from -56.9% at the 10th percentile to a gain of 0.7% at the 90th percentile (Table 203). The range of impact on hook gear was even greater with 8 vessels experiencing a loss of 73.7% or more with the same number of vessels experiencing revenue increases of 6.3% at the 90th percentile. Revenue impacts on trawl gear ranged between -33.4% and no change in revenue at the 10th percentile and 90th percentiles respectively. The disproportionate loss in revenue for hook and gillnet vessels operating on Georges Bank is due to the greater reliance on cod for fishing revenue as compared to trawl gear.

With the hard TAC backstop the disparity across gear groups does not disappear altogether but it is lessened. Specifically, at the 10th percentile gillnet and hook gear impacts were estimated to be -75.9% and -78.5% respectively. The impact on trawl gear was still lower, but was nearly 67%; a much smaller difference than estimated impacts without the hard TAC. The median vessel impact across gear groups was similar ranging between -34 and -38.1%.

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
Gillnet Gear (n= 181)							
10th Percentile and Below	18	Minimum	-56.9%	Minimum	-56.9%	Minimum	-75.9%
10th to 25th Percentile	27	-56.9%	-27.5%	-56.9%	-25.6%	-75.9%	-51.0%
25th to 50th Percentile	45	-27.5%	-12.9%	-25.6%	-13.6%	-51.0%	-34.0%
50th to 75th Percentile	45	-12.9%	-0.2%	-13.6%	-0.3%	-34.0%	-13.9%
75th to 90th Percentile	27	-0.2%	0.7%	-0.3%	0.6%	-13.9%	-2.9%
Above 90th Percentile	18	0.7%	Maximum	0.6%	Maximum	-2.9%	Maximum
Hook Gear (n=75)							
10th Percentile and Below	8	Minimum	-73.7%	Minimum	-73.7%	Minimum	-78.5%
10th to 25th Percentile	11	-73.7%	-54.7%	-73.7%	-54.7%	-78.5%	-61.0%
25th to 50th Percentile	19	-54.7%	-9.7%	-54.7%	-9.7%	-61.0%	-34.3%
50th to 75th Percentile	19	-9.7%	0.5%	-9.7%	0.5%	-34.3%	-6.7%
75th to 90th Percentile	11	0.5%	6.3%	0.5%	6.3%	-6.7%	-0.1%
Above 90th Percentile	8	6.3%	Maximum	6.3%	Maximum	-0.1%	Maximum
Trawl Gear (n=592)							
10th Percentile and Below	59	Minimum	-33.4%	Minimum	-33.6%	Minimum	-66.7%
10th to 25th Percentile	89	-33.4%	-24.8%	-33.6%	-25.3%	-66.7%	-55.6%
25th to 50th Percentile	148	-24.8%	-13.7%	-25.3%	-14.1%	-55.6%	-38.1%
50th to 75th Percentile	148	-13.7%	-3.5%	-14.1%	-3.5%	-38.1%	-15.7%
75th to 90th Percentile	89	-3.5%	0.0%	-3.5%	0.0%	-15.7%	-6.1%
Above 90th Percentile	59	0.0%	Maximum	0.0%	Maximum	-6.1%	Maximum

Table 203 - Proportional change in gross annual revenues by gear group for Alternative 2A and 2B

Impact by Vessel Length Class

Without a hard TAC backstop, the relative impacts of Alternative 2 on vessels of different sizes were similar for Alternatives 2A and 2B (Table 204). Across size classes the impacts on medium and large vessels were similar as there were only modest differences in revenue change at any percentile from the 10th to the 90th. By contrast, small vessels were substantially more affected at the 10th percentile (58.8% loss) than either medium (36.1%) or large (33.3%) vessels.

With a hard TAC backstop the impact was still proportionally greater on small vessels (-75.7%) at the 10th percentile but the relative distribution of impacts across vessels of differing sizes was similar at all other percentiles.

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Large (n=190)	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
10th Percentile and Below	19	Minimum	-33.3%	Minimum	-29.2%	Minimum	-63.9%
10th to 25th Percentile	29	-33.3%	-24.9%	-29.2%	-22.8%	-63.9%	-54.8%
25th to 50th Percentile	48	-24.9%	-12.7%	-22.8%	-12.1%	-54.8%	-32.2%
50th to 75th Percentile	48	-12.7%	-3.3%	-12.1%	-2.9%	-32.2%	-12.2%
75th to 90th Percentile	29	-3.3%	0.1%	-2.9%	0.2%	-12.2%	-5.0%
Above 90th Percentile	19	0.1%	Maximum	0.2%	Maximum	-5.0%	Maximum
Medium (n=485)							
10th Percentile and Below	49	Minimum	-36.1%	Minimum	-40.3%	Minimum	-69.6%
10th to 25th Percentile	73	-36.1%	-26.0%	-40.3%	-27.6%	-69.6%	-55.4%
25th to 50th Percentile	121	-26.0%	-14.4%	-27.6%	-14.7%	-55.4%	-40.1%
50th to 75th Percentile	121	-14.4%	-3.6%	-14.7%	-3.4%	-40.1%	-16.8%
75th to 90th Percentile	73	-3.6%	0.1%	-3.4%	0.1%	-16.8%	-5.7%
Above 90th Percentile	49	0.1%	Maximum	0.1%	Maximum	-5.7%	Maximum
Small (n=173)							
10th Percentile and Below	17	Minimum	-58.8%	Minimum	-58.8%	Minimum	-75.7%
10th to 25th Percentile	26	-58.8%	-31.4%	-58.8%	-34.5%	-75.7%	-58.5%
25th to 50th Percentile	43	-31.4%	-8.7%	-34.5%	-9.4%	-58.5%	-32.7%
50th to 75th Percentile	43	-8.7%	0.0%	-9.4%	0.0%	-32.7%	-11.3%
75th to 90th Percentile	26	0.0%	1.6%	0.0%	1.1%	-11.3%	-2.4%
Above 90th Percentile	17	1.6%	Maximum	1.1%	Maximum	-2.4%	Maximum

Table 204 - Proportional change in gross annual revenues by vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 2A and 2B

Impact by Gear/Length Groups

For trawl gear there was little difference among small, medium or large vessels in the distribution of revenue impacts (Table 205). For example, revenue impacts without a TAC backstop among the most negatively affected trawl vessels ranged from -32.4% for medium vessels and -35.1% for small vessels. Median impacts also fell within a relatively narrow range of -12.6% to -15.0% for large and medium trawl vessels, respectively. With a hard TAC backstop the relative distribution of impacts across trawl vessels was similar although estimated revenue impacts were consistently greater for small followed by medium then large vessels at the 10^{th}, 25^{th}, and 50^{th}

percentiles. At higher percentiles medium-sized vessels tended to be most impacted compared to other trawl vessels.

Both with and without the hard TAC backstop, small hook and small gillnet vessels tended to be comparatively more impacted than larger hook or gillnet vessels although both gear/size groupings were disproportionately affected relative to either trawl or gillnet gears. Without the TAC backstop, both small and larger gillnet vessels were similarly affected up to the 25th percentile but median impacts were lower for small gillnet vessels (-6.0%) compared to medium gillnet vessels (-14.4%). These larger gillnet vessels were estimated to experience larger revenue changes at higher percentiles as well. With the TAC backstop, efficiency gains from the increase in the GOM cod trip limit are lost as TACs. The TAC backstop, once reached, reduces overall fishing opportunities.

		Alternative 2A		**Alternative 2B**		**Alternative 2A & 2B With Hard TAC**	
Gear	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
Small Hook (n=51)							
10th Percentile and Below	5	Minimum	-80.4%	Minimum	-80.4%	Minimum	-86.7%
10th to 25th Percentile	8	-80.4%	-54.9%	-80.4%	-54.9%	-86.7%	-61.0%
25th to 50th Percentile	13	-54.9%	-27.5%	-54.9%	-27.5%	-61.0%	-34.3%
50th to 75th Percentile	13	-27.5%	0.0%	-27.5%	0.0%	-34.3%	-9.7%
75th to 90th Percentile	8	0.0%	3.2%	0.0%	3.2%	-9.7%	-0.6%
Above 90th Percentile	5	3.2%	Maximum	3.2%	Maximum	-0.6%	Maximum
Large Hook (n=24)							
10th Percentile and Below	2	Minimum	-60.8%	Minimum	-60.8%	Minimum	-70.4%
10th to 25th Percentile	4	-60.8%	-39.1%	-60.8%	-36.0%	-70.4%	-62.5%
25th to 50th Percentile	6	-39.1%	-1.3%	-36.0%	-1.3%	-62.5%	-32.7%
50th to 75th Percentile	6	-1.3%	2.6%	-1.3%	2.6%	-32.7%	-1.9%
75th to 90th Percentile	4	2.6%	19.3%	2.6%	19.3%	-1.9%	-0.1%
Above 90th Percentile	2	19.3%	Maximum	19.3%	Maximum	-0.1%	Maximum
Small Trawl (n=187)							
10th Percentile and Below	19	Minimum	-35.1%	Minimum	-41.5%	Minimum	-70.4%
10th to 25th Percentile	28	-35.1%	-26.3%	-41.5%	-30.5%	-70.4%	-58.1%
25th to 50th Percentile	47	-26.3%	-13.4%	-30.5%	-16.3%	-58.1%	-41.3%
50th to 75th Percentile	47	-13.4%	-2.2%	-16.3%	-2.6%	-41.3%	-15.9%
75th to 90th Percentile	28	-2.2%	0.0%	-2.6%	0.0%	-15.9%	-6.1%
Above 90th Percentile	19	0.0%	Maximum	0.0%	Maximum	-6.1%	Maximum
Medium Trawl (n=218)							
10th Percentile and Below	22	Minimum	-32.4%	Minimum	-32.4%	Minimum	-66.1%
10th to 25th Percentile	33	-32.4%	-23.5%	-32.4%	-25.2%	-66.1%	-55.3%
25th to 50th Percentile	55	-23.5%	-15.0%	-25.2%	-14.5%	-55.3%	-38.4%
50th to 75th Percentile	55	-15.0%	-4.8%	-14.5%	-4.5%	-38.4%	-19.1%
75th to 90th Percentile	33	-4.8%	-0.1%	-4.5%	0.0%	-19.1%	-7.9%

Above 90th Percentile	22	-0.1%	Maximum	0.0%	Maximum	-7.9%	Maximum
Large Trawl (n=187)							
10th Percentile and Below	19	Minimum	-33.4%	Minimum	-29.5%	Minimum	-63.8%
10th to 25th Percentile	28	-33.4%	-24.9%	-29.5%	-23.0%	-63.8%	-54.8%
25th to 50th Percentile	47	-24.9%	-12.6%	-23.0%	-12.4%	-54.8%	-31.9%
50th to 75th Percentile	47	-12.6%	-2.9%	-12.4%	-2.8%	-31.9%	-12.2%
75th to 90th Percentile	28	-2.9%	0.2%	-2.8%	0.2%	-12.2%	-4.7%
Above 90th Percentile	19	0.2%	Maximum	0.2%	Maximum	-4.7%	Maximum

Table 205 - Proportional change in gross annual revenues by gear group and vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 2A and 2B

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Gear	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
Small Gillnet (n=63)							
10th Percentile and Below	6	Minimum	-57.7%	Minimum	-57.7%	Minimum	-76.4%
10th to 25th Percentile	9	-57.7%	-25.2%	-57.7%	-25.2%	-76.4%	-53.5%
25th to 50th Percentile	16	-25.2%	-6.0%	-25.2%	-6.0%	-53.5%	-30.7%
50th to 75th Percentile	16	-6.0%	0.2%	-6.0%	0.0%	-30.7%	-9.5%
75th to 90th Percentile	9	0.2%	1.3%	0.0%	0.9%	-9.5%	-2.4%
Above 90th Percentile	6	1.3%	Maximum	0.9%	Maximum	-2.4%	Maximum
Medium Gillnet (n=118)							
10th Percentile and Below	12	Minimum	-56.9%	Minimum	-56.9%	Minimum	-75.9%
10th to 25th Percentile	18	-56.9%	-29.0%	-56.9%	-25.6%	-75.9%	-49.4%
25th to 50th Percentile	30	-29.0%	-14.4%	-25.6%	-14.4%	-49.4%	-34.5%
50th to 75th Percentile	30	-14.4%	-2.4%	-14.4%	-2.8%	-34.5%	-14.6%
75th to 90th Percentile	18	-2.4%	0.4%	-2.8%	0.4%	-14.6%	-2.9%
Above 90th Percentile	12	0.4%	Maximum	0.4%	Maximum	-2.9%	Maximum

Table 205 - Proportional change in gross annual revenues by gear group and vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 2A and 2B(cont.)

Impacts by Home Port State

Without a TAC backstop, Alternative 2 measures would have least impact on New Jersey vessels and would have greatest overall impact on Massachusetts vessels (Table 206). The median vessel impact (-23.2%) was greater for Massachusetts vessels than any other state and the impact on the most affected vessels was -58.8% or more which exceeded the next closest state (New Hampshire) by almost 19 percentage points.

The overall impact on gross annual revenues was similar for Rhode Island and for New York/Connecticut vessels as revenue impacts ranged from -20.7%/-17.2% to no change/+0.7% in Rhode Island and New York/Connecticut respectively. Among the remaining states the relative impact on New Hampshire vessels was greater than that of Maine vessels since the estimated revenue change was more deleterious at all percentiles for New Hampshire than for Maine vessels.

The hard TAC backstop would increase estimated revenue reductions but the overall pattern of effects across differing state would be unchanged. The state of Massachusetts would still be most impacted followed by New Hampshire and Maine. The relative distribution of impacts on Rhode Island and New York/Connecticut would still be roughly equivalent and New Jersey vessels would be least affected.

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Home Port State	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
Massachusetts (n=396)							
10th Percentile and Below	40	Minimum	-58.8%	Minimum	-58.8%	Minimum	-75.9%
10th to 25th Percentile	59	-58.8%	-33.9%	-58.8%	-33.5%	-75.9%	-64.7%
25th to 50th Percentile	99	-33.9%	-23.2%	-33.5%	-22.3%	-64.7%	-50.1%
50th to 75th Percentile	99	-23.2%	-11.1%	-22.3%	-10.0%	-50.1%	-29.5%
75th to 90th Percentile	59	-11.1%	0.0%	-10.0%	0.0%	-29.5%	-11.5%
Above 90th Percentile	40	0.0%	Maximum	0.0%	Maximum	-11.5%	Maximum
Maine (n=131)							
10th Percentile and Below	13	Minimum	-27.2%	Minimum	-30.9%	Minimum	-60.8%
10th to 25th Percentile	20	-27.2%	-21.2%	-30.9%	-23.9%	-60.8%	-52.7%
25th to 50th Percentile	33	-21.2%	-13.6%	-23.9%	-14.8%	-52.7%	-44.0%
50th to 75th Percentile	33	-13.6%	-1.1%	-14.8%	-3.4%	-44.0%	-28.5%
75th to 90th Percentile	20	-1.1%	0.4%	-3.4%	0.1%	-28.5%	-7.0%
Above 90th Percentile	13	0.4%	Maximum	0.1%	Maximum	-7.0%	Maximum
New Hampshire (n=60)							
10th Percentile and Below	6	Minimum	-39.9%	Minimum	-44.3%	Minimum	-67.7%
10th to 25th Percentile	9	-39.9%	-30.1%	-44.3%	-30.1%	-67.7%	-57.8%
25th to 50th Percentile	15	-30.1%	-20.4%	-30.1%	-21.1%	-57.8%	-46.3%
50th to 75th Percentile	15	-20.4%	-5.4%	-21.1%	-4.5%	-46.3%	-36.0%
75th to 90th Percentile	9	-5.4%	0.7%	-4.5%	0.2%	-36.0%	-17.5%
Above 90th Percentile	6	0.7%	Maximum	0.2%	Maximum	-17.5%	Maximum
New Jersey (n=45)							
10th Percentile and Below	5	Minimum	-9.3%	Minimum	-13.0%	Minimum	-19.6%
10th to 25th Percentile	7	-9.3%	-5.8%	-13.0%	-5.5%	-19.6%	-14.4%
25th to 50th Percentile	11	-5.8%	-1.2%	-5.5%	-1.2%	-14.4%	-7.9%
50th to 75th	11	-1.2%	0.2%	-1.2%	0.2%	-7.9%	-3.9%

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Home Port State	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
Percentile							
75th to 90th Percentile	7	0.2%	2.8%	0.2%	2.8%	-3.9%	-1.7%
Above 90th Percentile	5	2.8%	Maximum	2.8%	Maximum	-1.7%	Maximum

Table 206 – Proportional change in gross revenue by home port state for Alternative 2A and 2B

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Home Port State	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
New York/Connecticut (n = 95)							
10th Percentile and Below	10	Minimum	-20.7%	Minimum	-20.7%	Minimum	-40.7%
10th to 25th Percentile	14	-20.7%	-12.2%	-20.7%	-11.2%	-40.7%	-30.1%
25th to 50th Percentile	24	-12.2%	-3.8%	-11.2%	-3.3%	-30.1%	-16.9%
50th to 75th Percentile	24	-3.8%	-0.1%	-3.3%	-0.1%	-16.9%	-6.8%
75th to 90th Percentile	14	-0.1%	0.0%	-0.1%	0.6%	-6.8%	-1.4%
Above 90th Percentile	10	0.0%	Maximum	0.6%	Maximum	-1.4%	Maximum
Rhode Island (n=96)							
10th Percentile and Below	10	Minimum	-17.2%	Minimum	-15.9%	Minimum	-46.6%
10th to 25th Percentile	14	-17.2%	-10.9%	-15.9%	-10.9%	-46.6%	-35.2%
25th to 50th Percentile	24	-10.9%	-5.3%	-10.9%	-4.9%	-35.2%	-19.3%
50th to 75th Percentile	24	-5.3%	-0.2%	-4.9%	0.0%	-19.3%	-10.1%
75th to 90th Percentile	14	-0.2%	0.7%	0.0%	0.9%	-10.1%	-2.9%
Above 90th Percentile	10	0.7%	Maximum	0.9%	Maximum	-2.9%	Maximum
All Other (n=25)							
10th Percentile and Below	3	Minimum	-28.3%	Minimum	-21.4%	Minimum	-40.6%
10th to 25th Percentile	4	-28.3%	-8.8%	-21.4%	-8.8%	-40.6%	-17.6%
25th to 50th Percentile	6	-8.8%	-2.5%	-8.8%	-2.5%	-17.6%	-8.8%
50th to 75th Percentile	6	-2.5%	-0.4%	-2.5%	-0.4%	-8.8%	-5.4%
75th to 90th Percentile	4	-0.4%	1.6%	-0.4%	1.6%	-5.4%	-1.2%
Above 90th Percentile	3	1.6%	Maximum	1.6%	Maximum	-1.2%	Maximum

Table 206 – Proportional change in gross revenue by home port state for Alternative 2A and 2B

Impacts by Port Groups

Across all ports and port groups the largest reduction in annual fishing income would be in the port group of Chatham/Harwich with three-fourths of all vessels losing at least 29.7% of fishing revenue and half of all vessels losing more than half of fishing income. The impacts on these ports are directly related to the reduction in the GB cod trip limit as this port group is a center for the Cape Cod hook and gillnet fleet that relies heavily on GB cod for fishing revenue.

The Chatham/Harwich port group would still be the most impacted area under a TAC backstop with three-fourths of all vessels losing nearly 50% of annual fishing income. Among the most impacted vessels the estimated revenue loss was at least 77%.

Without a hard TAC backstop, the distribution of revenue changes was similar for the ports of Provincetown, Gloucester, Portland, Portsmouth, South Shore Massachusetts, New Hampshire Seacoast, New Bedford and Boston. Thus, even though the revenue impacts among these ports do differ, Alternative 2 does not disproportionately disadvantage these ports over one another. Ports that may be expected to experience lowest revenue impact include Point Judith and the Eastern Long Island port group.

The hard TAC backstop would change the relative distribution of impacts across port groups. As noted previously, Chatham/Harwich would be most impacted but Gloucester would also be disproportionately affected whereas the relative distribution of impacts on the ports of New Bedford, New Hampshire Seacoast, Portland, Portsmouth, Provincetown, and Upper Mid-Coast Maine would be similar.

		Alternative 2A		**Alternative 2B**		**Alternative 2A & 2B With Hard TAC**	
Port Group	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
Boston (n=20)							
25th Percentile and Below	5	Minimum	-30.2%	Minimum	-25.0%	Minimum	-60.3%
25th to 50th Percentile	5	-30.2%	-22.5%	-25.0%	-16.8%	-60.3%	-55.7%
50th to 75th Percentile	5	-22.5%	-7.1%	-16.8%	-6.0%	-55.7%	-18.9%
Above 75th Percentile	5	-7.1%	Maximum	-6.0%	Maximum	-18.9%	Maximum
Chatham/Harwich (n=50)							
25th Percentile and Below	13	Minimum	-62.6%	Minimum	-62.6%	Minimum	-77.0%
25th to 50th Percentile	13	-62.6%	-51.2%	-62.6%	-50.7%	-77.0%	-65.4%
50th to 75th Percentile	13	-51.2%	-29.7%	-50.7%	-29.3%	-65.4%	-49.4%
Above 75th Percentile	13	-29.7%	Maximum	-29.3%	Maximum	-49.4%	Maximum
Eastern Long Island (n=40)							
25th Percentile and Below	10	Minimum	-12.4%	Minimum	-11.4%	Minimum	-25.3%
25th to 50th Percentile	10	-12.4%	-4.5%	-11.4%	-4.5%	-25.3%	-13.8%
50th to 75th Percentile	10	-4.5%	-1.3%	-4.5%	-1.3%	-13.8%	-4.1%
Above 75th Percentile	10	-1.3%	Maximum	-1.3%	Maximum	-4.1%	Maximum
Gloucester (n=97)							
25th Percentile and Below	24	Minimum	-33.9%	Minimum	-36.0%	Minimum	-70.4%
25th to 50th Percentile	24	-33.9%	-26.3%	-36.0%	-25.2%	-70.4%	-56.0%
50th to 75th Percentile	24	-26.3%	-7.3%	-25.2%	-8.7%	-56.0%	-37.7%
Above 75th Percentile	24	-7.3%	Maximum	-8.7%	Maximum	-37.7%	Maximum

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Port Group	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
New Bedford (n=96)							
25th Percentile and Below	24	Minimum	-29.4%	Minimum	-25.9%	Minimum	-61.3%
25th to 50th Percentile	24	-29.4%	-22.2%	-25.9%	-21.2%	-61.3%	-49.9%
50th to 75th Percentile	24	-22.2%	-11.9%	-21.2%	-10.8%	-49.9%	-32.4%
Above 75th Percentile	24	-11.9%	Maximum	-10.8%	Maximum	-32.4%	Maximum

Table 207 - Proportional change in gross annual revenues by port group for Alternative 2A and 2B

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Port Group	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
New Hampshire Seacoast (n=32)							
25th Percentile and Below	8	Minimum	-30.5%	Minimum	-31.8%	Minimum	-58.4%
25th to 50th Percentile	8	-30.5%	-21.3%	-31.8%	-25.5%	-58.4%	-46.4%
50th to 75th Percentile	8	-21.3%	-3.4%	-25.5%	-2.9%	-46.4%	-33.0%
Above 75th Percentile	8	-3.4%	Maximum	-2.9%	Maximum	-33.0%	Maximum
Point Judith (n=49)							
25th Percentile and Below	12	Minimum	-10.3%	Minimum	-9.4%	Minimum	-37.6%
25th to 50th Percentile	12	-10.3%	-5.8%	-9.4%	-5.1%	-37.6%	-27.9%
50th to 75th Percentile	12	-5.8%	-0.9%	-5.1%	-0.3%	-27.9%	-12.5%
Above 75th Percentile	12	-0.9%	Maximum	-0.3%	Maximum	-12.5%	Maximum
Portland (n=39)							
25th Percentile and Below	10	Minimum	-28.0%	Minimum	-23.9%	Minimum	-59.5%
25th to 50th Percentile	10	-28.0%	-22.9%	-23.9%	-18.0%	-59.5%	-50.9%
50th to 75th Percentile	10	-22.9%	-15.1%	-18.0%	-13.6%	-50.9%	-44.1%
Above 75th Percentile	10	-15.1%	Maximum	-13.6%	Maximum	-44.1%	Maximum
Portsmouth (n=26)							
25th Percentile and Below	7	Minimum	-26.1%	Minimum	-26.0%	Minimum	-54.3%
25th to 50th Percentile	7	-26.1%	-21.4%	-26.0%	-20.7%	-54.3%	-46.3%
50th to 75th Percentile	7	-21.4%	-13.1%	-20.7%	-15.8%	-46.3%	-36.4%
Above 75th Percentile	7	-13.1%	Maximum	-15.8%	Maximum	-36.4%	Maximum
Provincetown (n=19)							
25th Percentile and Below	5	Minimum	-29.2%	Minimum	-28.5%	Minimum	-55.6%
25th to 50th Percentile	5	-29.2%	-21.6%	-28.5%	-22.3%	-55.6%	-47.6%
50th to 75th Percentile	5	-21.6%	-15.7%	-22.3%	-15.0%	-47.6%	-40.1%
Above 75th Percentile	5	-15.7%	Maximum	-15.0%	Maximum	-40.1%	Maximum

Table 207 - Proportional change in gross annual revenues by port group for Alternative 2A and 2B(cont.)

		Alternative 2A		Alternative 2B		Alternative 2A & 2B With Hard TAC	
Port Group	Number of Vessels	Lower	Upper	Lower	Upper	Lower	Upper
South Shore Massachusetts (n=37)							
25th Percentile and Below	9	Minimum	-37.6%	Minimum	-36.2%	Minimum	-58.7%
25th to 50th Percentile	9	-37.6%	-18.4%	-36.2%	-18.4%	-58.7%	-40.2%
50th to 75th Percentile	9	-18.4%	-3.9%	-18.4%	-7.6%	-40.2%	-21.5%
Above 75th Percentile	9	-3.9%	Maximum	-7.6%	Maximum	-21.5%	Maximum
Upper Mid-Coast Maine (n=19)							
25th Percentile and Below	5	Minimum	-19.8%	Minimum	-31.9%	Minimum	-52.7%
25th to 50th Percentile	5	-19.8%	-14.6%	-31.9%	-23.3%	-52.7%	-47.4%
50th to 75th Percentile	5	-14.6%	-0.1%	-23.3%	-6.3%	-47.4%	-41.6%
Above 75th Percentile	5	-0.1%	Maximum	-6.3%	Maximum	-41.6%	Maximum
Other (n=325)							
25th Percentile and Below	81	Minimum	-15.6%	Minimum	-16.3%	Minimum	-38.2%
25th to 50th Percentile	81	-15.6%	-5.5%	-16.3%	-5.0%	-38.2%	-19.5%
50th to 75th Percentile	81	-5.5%	0.0%	-5.0%	0.0%	-19.5%	-7.3%
Above 75th Percentile	81	0.0%	Maximum	0.0%	Maximum	-7.3%	Maximum

Table 207 - Proportional change in gross annual revenues by port group for Alternative 2A and 2B(cont.)

5.4.4.4 Impacts on Vessel Fishing Revenue of Alternative 3

As proposed, other than area-species TACs, Alternative 3 (area management) would not implement any specific new measures as these would be developed later by some yet to be determined form of area management team or other type of governing body. The area closure model was used to estimate the impacts of current measures that would remain in place as well as the economic impact of a hard TAC. As noted previously, the area closure model treats a hard TAC as equivalent to an individual vessel quota and so does not evaluate area-specific quotas without also prorating those quotas by species and areas to individual vessels. However, the area closure model also limits fishing choices to areas that had been fished by a given vessel. This means that the area closure model already incorporates some aspects that would be consistent with assignment of a species-area TAC so the results may reasonably approximate the impact of an area TAC particularly one that is based primarily on logbook records.

Other than area-specific TACs the default management measures including trip limits, area closures and DAS allocations are identical to Alternative 4. For this reason, the economic impact of the Alternative 3 measures with a hard TAC are discussed with Alternative 4. See the following section for that discussion and an analysis of the impacts.

5.4.4.5 Impacts on Vessel Fishing Revenue of Hard TAC Alternatives (3, 4 and 4A)

Alternative 3, 4 and 4A implement a hard TAC in addition to different suites of area closures, DAS allocations, and gear restrictions. In spite of these differences the estimated impact of all three alternatives was approximately the same because the hard TAC becomes the primary measure that constrains individual vessels. Note that the gear differences between the two alternatives could not be taken into account because the base data for the area closure model included catch information for 1998-2001. These years would be consistent with Alternative 4A but would not reflect the effect of current gear restrictions that are also proposed for Alternative 4. How this affects the analysis is unclear. On the one hand, larger mesh associated with Alternative 4 may result in lower catch rates and the TAC might not be reached as quickly while on the other DAS allocations are lower. Relative to Alternative 4A, the former effect might mean that the revenue reduction could be overestimated while the latter effect may offset this potential bias so that the difference in economic effect between Alternatives 4 and 4A would be negligible.

As noted previously, Alternative 3 was modeled in its default form as though it were identical to Alternative 4. Therefore, in the following discussion, Alternatives 3 and 4 are referred to as a single alternative, called Alternative 3/4. Given that the default would likely to be changed once the specific management areas, method for assigning TACs, and most importantly, mechanism for developing measures for each area have been determined, the estimated impact of Alternative 3/4 may be an upper-bound. Presumably, management measures by area would be designed so as to reduce overall economic impacts on area participants but the form that these measures will take cannot be anticipated at this time.

For both Alternative 3/4 and 4A the total revenue loss from all species on groundfish trips was estimated to be $59.9 million. Median revenue loss was estimated to be 35 to 36% (Table 208). Revenue losses for the most affected vessels would be at least 63.2% while revenue losses for the least affected vessels would be approximately 5%.

The relative distribution of impacts for both Alternative 3/4 and 4A are virtually identical. This does not necessarily mean that the two alternatives affect all vessels the same way. That is, the impact on the median vessel (or at any other percentile) may be the same for both alternatives but may not be the same vessel. The primary source of differential impact across Alternative 3/4 and 4A is likely to be the area closures particularly for vessels that fish within a limited range and/or within a relatively short season. However, even though the two Alternatives affect different vessels differently, the overall estimated impact on the groundfish fleet was similar.

		Alternative 3/4		**Alternative 4A**	
	Number of Vessels	Lower	Upper	Lower	Upper
10th Percentile and Below	85	Minimum	-63.2%	Minimum	-63.2%
10th to 25th Percentile	127	-63.2%	-51.8%	-63.2%	-51.8%
25th to 50th Percentile	212	-51.8%	-35.4%	-51.8%	-36.2%
50th to 75th Percentile	212	-35.4%	-13.8%	-36.2%	-13.9%
75th to 90th Percentile	127	-13.8%	-4.6%	-13.9%	-4.9%
Above 90th Percentile	85	-4.6%	Maximum	-4.9%	Maximum

Table 208 - Fleet-wide impacts of Alternative 3/4 and 4A

Impact by Dependence on Groundfish

The impact on gross annual fishing revenue increases with dependence on groundfish (Table 209). Estimated revenue impacts ranged between -13.8% at the 10th percentile to -0.1% at the 90th percentile for vessels that rely on groundfish for less than one-quarter of annual fishing revenue.

By contrast, gross revenues for vessels most dependent on groundfish were estimated to decline by at least 70% for the 37 vessels at or below the 10th percentile. At the 90th percentile vessels were estimated to lose between 35 and 37% of gross revenue for Alternative 3/4 and 4A respectively.

		Alternative 3/4		**Alternative 4A**	
Dependence on Groundfish	Number of Vessels	Lower	Upper	Lower	Upper
Less than 25% (n = 182)					
10th Percentile and Below	18	Minimum	-13.6%	Minimum	-13.8%
10th to 25th Percentile	27	-13.6%	-9.6%	-13.8%	-9.7%
25th to 50th Percentile	46	-9.6%	-5.8%	-9.7%	-5.8%
50th to 75th Percentile	46	-5.8%	-1.9%	-5.8%	-2.1%
75th to 90th Percentile	27	-1.9%	-0.1%	-2.1%	-0.1%
Above 90th Percentile	18	-0.1%	Maximum	-0.1%	Maximum
25 to less than 50% (n = 142)					
10th Percentile and Below	14	Minimum	-30.9%	Minimum	-30.4%
10th to 25th Percentile	21	-30.9%	-25.8%	-30.4%	-25.5%
25th to 50th Percentile	36	-25.8%	-18.9%	-25.5%	-19.0%
50th to 75th Percentile	36	-18.9%	-12.7%	-19.0%	-13.1%
75th to 90th Percentile	21	-12.7%	-9.3%	-13.1%	-9.4%
Above 90th Percentile	14	-9.3%	Maximum	-9.4%	Maximum
50% to less than 75% (n = 153)					
10th Percentile and Below	15	Minimum	-52.4%	Minimum	-50.7%
10th to 25th Percentile	23	-52.4%	-44.3%	-50.7%	-44.1%
25th to 50th Percentile	38	-44.3%	-36.6%	-44.1%	-36.6%
50th to 75th Percentile	38	-36.6%	-30.2%	-36.6%	-31.2%
75th to 90th Percentile	23	-30.2%	-24.2%	-31.2%	-21.9%
Above 90th Percentile	15	-24.2%	Maximum	-21.9%	Maximum
75% or Greater (n = 371)					
10th Percentile and Below	37	Minimum	-70.9%	Minimum	-69.7%
10th to 25th Percentile	56	-70.9%	-61.3%	-69.7%	-61.5%
25th to 50th Percentile	93	-61.3%	-53.0%	-61.5%	-53.1%
50th to 75th Percentile	93	-53.0%	-44.4%	-53.1%	-44.7%
75th to 90th Percentile	56	-44.4%	-34.7%	-44.7%	-37.4%
Above 90th Percentile	37	-34.7%	Maximum	-37.4%	Maximum

Table 209 - Revenue impacts by dependency on groundfish for Alternative 3/4 and 4A

Impact by Entity Size in Terms of Gross Sales

At the 10th percentile estimated revenue reductions ranged from 61 to 67% regardless of the amount of annual gross groundfish sales (Table 210). At the 25th percentile, the revenue reductions were lower (about 40%) for vessels with groundfish sales of $35 thousand or less as compared to vessels with higher groundfish sales (52 to 55%). Similarly, the revenue changes for vessels with the least groundfish sales at higher percentiles were also lower than that of vessels with more than $35 thousand in groundfish sales at the same percentile. However, the relative distribution of revenue impacts was similar for each sales interval above $35 thousand. This means that based on gross sales, neither Alternative 3/4 nor Alternative 4A would have a disproportional impact on about three-quarters of the groundfish fleet.

		Alternative 3/4		Alternative 4A	
Gross Groundfish Sales Intervals	Number of Vessels	Lower	Upper	Lower	Upper
$35,000 or less (n = 209)					
10th Percentile and Below	21	Minimum	-61.0%	Minimum	-62.9%
10th to 25th Percentile	31	-61.0%	-37.3%	-62.9%	-39.8%
25th to 50th Percentile	52	-37.3%	-12.8%	-39.8%	-13.4%
50th to 75th Percentile	52	-12.8%	-3.4%	-13.4%	-3.5%
75th to 90th Percentile	31	-3.4%	-0.5%	-3.5%	-0.5%
Above 90th Percentile	21	-0.5%	Maximum	-0.5%	Maximum
$35,001 to $100,000 (n = 245)					
10th Percentile and Below	25	Minimum	-67.5%	Minimum	-66.6%
10th to 25th Percentile	37	-67.5%	-52.6%	-66.6%	-53.1%
25th to 50th Percentile	61	-52.6%	-35.5%	-53.1%	-36.7%
50th to 75th Percentile	61	-35.5%	-16.8%	-36.7%	-16.4%
75th to 90th Percentile	37	-16.8%	-8.0%	-16.4%	-8.0%
Above 90th Percentile	25	-8.0%	Maximum	-8.0%	Maximum
$100,001 to $250,000 (n = 197)					
10th Percentile and Below	21	Minimum	-59.7%	Minimum	-60.1%
10th to 25th Percentile	31	-59.7%	-48.9%	-60.1%	-48.9%
25th to 50th Percentile	47	-48.9%	-39.7%	-48.9%	-39.7%
50th to 75th Percentile	47	-39.7%	-25.5%	-39.7%	-26.1%
75th to 90th Percentile	31	-25.5%	-11.7%	-26.1%	-11.7%
Above 90th Percentile	21	-11.7%	Maximum	-11.7%	Maximum
$250,001 or more (n = 187)					
10th Percentile and Below	19	Minimum	-61.3%	Minimum	-61.4%
10th to 25th Percentile	28	-61.3%	-55.8%	-61.4%	-55.4%
25th to 50th Percentile	47	-55.8%	-46.4%	-55.4%	-46.6%
50th to 75th Percentile	47	-46.4%	-27.0%	-46.6%	-26.7%
75th to 90th Percentile	28	-27.0%	-10.7%	-26.7%	-10.7%
Above 90th Percentile	19	-10.7%	Maximum	-10.7%	Maximum

Table 210 - Revenue impacts by gross sales of groundfish for Alternative 3/4 and 4A

Impact by Gear Groups

The relative distribution of estimated changes in annual fishing revenue was comparable across gear groups for both Alternative 3/4 and 4A (Table 211). Although the estimated revenue reduction at every percentile was consistently ordered from lowest (hook gear) to highest (trawl gear), the difference in impact at each percentile was no more than five percentage points. Thus, even though the total impact would be largest on trawl gear (nearly 70% of total vessels), Alternative 3/4 would not place any given vessel at a competitive disadvantage based solely on gear.

		Alternative 3/4		Alternative 4A	
Gillnet Gear (n= 181)	Number of Vessels	Lower	Upper	Lower	Upper
10th Percentile and Below	18	Minimum	-59.7%	Minimum	-61.5%

10th to 25th Percentile	27	-59.7%	-46.5%	-61.5%	-47.8%
25th to 50th Percentile	45	-46.5%	-33.0%	-47.8%	-34.8%
50th to 75th Percentile	45	-33.0%	-13.4%	-34.8%	-13.4%
75th to 90th Percentile	27	-13.4%	-2.9%	-13.4%	-2.5%
Above 90th Percentile	18	-2.9%	Maximum	-2.5%	Maximum
Hook Gear (n=75)					
10th Percentile and Below	8	Minimum	-60.5%	Minimum	-59.8%
10th to 25th Percentile	11	-60.5%	-45.6%	-59.8%	-45.6%
25th to 50th Percentile	19	-45.6%	-29.0%	-45.6%	-33.4%
50th to 75th Percentile	19	-29.0%	-5.5%	-33.4%	-6.2%
75th to 90th Percentile	11	-5.5%	-0.1%	-6.2%	-0.1%
Above 90th Percentile	8	-0.1%	Maximum	-0.1%	Maximum
Trawl Gear (n=592)					
10th Percentile and Below	59	Minimum	-63.9%	Minimum	-64.0%
10th to 25th Percentile	89	-63.9%	-53.6%	-64.0%	-53.6%
25th to 50th Percentile	148	-53.6%	-37.0%	-53.6%	-37.2%
50th to 75th Percentile	148	-37.0%	-15.2%	-37.2%	-15.2%
75th to 90th Percentile	89	-15.2%	-6.1%	-15.2%	-6.1%
Above 90th Percentile	59	-6.1%	Maximum	-6.1%	Maximum

Table 211 - Proportional change in gross annual revenues by gear group for Alternative 3/4 and 4A

Impact by Vessel Length Class

The distributions of estimated revenue reductions were similar for all vessels size classes for both Alternatives 4 and 4A (Table 212). At the 10th percentile estimated losses were largest for small vessels (64.2% for Alternative 4A) as compared to medium (63.2%) and large vessels (58.7%), although these differences are not large. At all other percentiles estimated revenue reductions were higher for medium than for either small or large vessels, but once again, the difference across vessel length categories was less than 10 percentage points.

		Alternative 3/4		Alternative 4A	
Large (n=190)	Number of Vessels	Lower	Upper	Lower	Upper
10th Percentile and Below	19	Minimum	-58.7%	Minimum	-58.7%
10th to 25th Percentile	29	-58.7%	-51.5%	-58.7%	-51.7%
25th to 50th Percentile	48	-51.5%	-30.0%	-51.7%	-30.0%
50th to 75th Percentile	48	-30.0%	-10.8%	-30.0%	-10.8%
75th to 90th Percentile	29	-10.8%	-4.5%	-10.8%	-4.5%
Above 90th Percentile	19	-4.5%	Maximum	-4.5%	Maximum
Medium (n=485)					
10th Percentile and Below	49	Minimum	-64.1%	Minimum	-63.2%
10th to 25th Percentile	73	-64.1%	-52.6%	-63.2%	-52.2%
25th to 50th Percentile	121	-52.6%	-37.6%	-52.2%	-38.2%
50th to 75th Percentile	121	-37.6%	-16.8%	-38.2%	-16.8%
75th to 90th Percentile	73	-16.8%	-5.6%	-16.8%	-5.7%
Above 90th Percentile	49	-5.6%	Maximum	-5.7%	Maximum
Small (n=173)					
10th Percentile and Below	17	Minimum	-63.8%	Minimum	-64.2%
10th to 25th Percentile	26	-63.8%	-47.3%	-64.2%	-47.2%
25th to 50th Percentile	43	-47.3%	-29.0%	-47.2%	-31.2%
50th to 75th Percentile	43	-29.0%	-11.0%	-31.2%	-11.1%
75th to 90th Percentile	26	-11.0%	-2.4%	-11.1%	-2.5%
Above 90th Percentile	17	-2.4%	Maximum	-2.5%	Maximum

Table 212 - Proportional change in gross annual revenues by vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 3/4 and 4A

Impact by Gear/Length Groups

Alternative 3/4 and 4A would have similar impacts among hook vessels of differing size although estimated revenue reductions among 10% of the most affected vessels would be greater for small (60.6%) than for large (52.2%) hook vessels. However, the difference between the two size classes of hook vessels is less than five percentage points at all other percentiles.

Small trawl vessels would be comparatively more affected by either Alternative 3/4 or 4A at all percentiles up to the median vessel as compared to either medium or large trawl vessels. Similarly, medium trawl vessels were estimated to incur higher revenue losses than large vessels at all percentiles. Thus, Alternative 3/4 and 4A would tend to have disproportional affects across vessel size classes with large vessels being least impacted followed by medium and small vessels, although the difference in economic affect by vessel size class is not large.

The estimated revenue losses among gillnet vessels of differing size was similar with no more than four to five percentage points separating either size class across all percentiles. Thus, Alternative 3/4 and Alternative 4A would not result in disproportionate economic impacts among gillnet vessels of differing lengths.

		Alternative 3/4		Alternative 4A	
Small Hook (n=51)	Number of Vessels	Lower	Upper	Lower	Upper
10th Percentile and Below	5	Minimum	-60.6%	Minimum	-60.6%
10th to 25th Percentile	8	-60.6%	-43.6%	-60.6%	-44.5%
25th to 50th Percentile	13	-43.6%	-27.5%	-44.5%	-33.4%
50th to 75th Percentile	13	-27.5%	-7.2%	-33.4%	-7.7%
75th to 90th Percentile	8	-7.2%	-0.6%	-7.7%	-0.8%
Above 90th Percentile	5	-0.6%	Maximum	-0.8%	Maximum
Large Hook (n=24)					
10th Percentile and Below	2	Minimum	-58.8%	Minimum	-52.2%
10th to 25th Percentile	4	-58.8%	-48.5%	-52.2%	-47.2%
25th to 50th Percentile	6	-48.5%	-32.7%	-47.2%	-37.2%
50th to 75th Percentile	6	-32.7%	-1.9%	-37.2%	-2.9%
75th to 90th Percentile	4	-1.9%	-0.1%	-2.9%	-0.1%
Above 90th Percentile	2	-0.1%	Maximum	-0.1%	Maximum
Small Trawl (n=187)					
10th Percentile and Below	19	Minimum	-67.8%	Minimum	-66.3%
10th to 25th Percentile	28	-67.8%	-56.2%	-66.3%	-57.6%
25th to 50th Percentile	47	-56.2%	-41.3%	-57.6%	-41.4%
50th to 75th Percentile	47	-41.3%	-15.9%	-41.4%	-15.2%
75th to 90th Percentile	28	-15.9%	-6.1%	-15.2%	-6.1%
Above 90th Percentile	19	-6.1%	Maximum	-6.1%	Maximum
Medium Trawl (n=218)					
10th Percentile and Below	22	Minimum	-63.7%	Minimum	-63.2%
10th to 25th Percentile	33	-63.7%	-53.1%	-63.2%	-53.2%
25th to 50th Percentile	55	-53.1%	-37.7%	-53.2%	-37.7%
50th to 75th Percentile	55	-37.7%	-19.0%	-37.7%	-19.0%
75th to 90th Percentile	33	-19.0%	-8.0%	-19.0%	-8.0%
Above 90th Percentile	22	-8.0%	Maximum	-8.0%	Maximum
Large Trawl (n=187)					
10th Percentile and Below	19	Minimum	-63.7%	Minimum	-58.5%
10th to 25th Percentile	28	-63.7%	-51.5%	-58.5%	-51.7%
25th to 50th Percentile	47	-51.5%	-29.8%	-51.7%	-29.8%
50th to 75th Percentile	47	-29.8%	-10.8%	-29.8%	-10.8%
75th to 90th Percentile	28	-10.8%	-4.1%	-10.8%	-4.1%
Above 90th Percentile	19	-4.1%	Maximum	-4.1%	Maximum

Table 213 - Proportional change in gross annual revenues by gear group and vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 3/4 and 4A

		Alternative 3/4		Alternative 4A	
Small Hook (n=51)	Number of Vessels	Lower	Upper	Lower	Upper
Small Gillnet (n=63)					
10th Percentile and Below	6	Minimum	-58.5%	Minimum	-64.0%
10th to 25th Percentile	9	-58.5%	-51.5%	-64.0%	-53.5%
25th to 50th Percentile	16	-51.5%	-29.8%	-53.5%	-31.2%
50th to 75th Percentile	16	-29.8%	-10.8%	-31.2%	-9.8%
75th to 90th Percentile	9	-10.8%	-4.1%	-9.8%	-2.5%
Above 90th Percentile	6	-4.1%	Maximum	-2.5%	Maximum
Medium Gillnet (n=118)					
10th Percentile and Below	12	Minimum	-66.5%	Minimum	-59.6%
10th to 25th Percentile	18	-66.5%	-49.1%	-59.6%	-47.0%
25th to 50th Percentile	30	-49.1%	-28.5%	-47.0%	-34.9%
50th to 75th Percentile	30	-28.5%	-9.5%	-34.9%	-13.9%
75th to 90th Percentile	18	-9.5%	-2.4%	-13.9%	-2.9%
Above 90th Percentile	12	-2.4%	Maximum	-2.9%	Maximum

Table 213 - Proportional change in gross annual revenues by gear group and vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 3/4 and 4A

Impacts by Home Port State

The estimated revenue changes across different states would be similar for New Hampshire and Massachusetts vessels up to the 25th percentile (Table 214). Revenue reductions for Massachusetts (45.8%), Maine (43.5%) and New Hampshire (45.1%) were similar at the 25th percentile, but estimated reductions on New Hampshire vessels were larger than either Maine or Massachusetts at the 75th and the 90th percentiles.

Alternatives 3/4 and 4A would have least impact on New Jersey vessels. The estimated revenue reduction on Rhode Island was similar to that of New York/Connecticut vessels although Rhode Island vessels were more negatively affected at all percentiles.

		Alternative 3/4		Alternative 4A	
Home Port State	Number of Vessels	Lower	Upper	Lower	Upper
Massachusetts (n=396)					
10th Percentile and Below	40	Minimum	-68.8%	Minimum	-67.6%
10th to 25th Percentile	59	-68.8%	-58.5%	-67.6%	-58.4%
25th to 50th Percentile	99	-58.5%	-45.8%	-58.4%	-45.8%
50th to 75th Percentile	99	-45.8%	-27.4%	-45.8%	-27.3%
75th to 90th Percentile	59	-27.4%	-10.8%	-27.3%	-10.7%
Above 90th Percentile	40	-10.8%	Maximum	-10.7%	Maximum
Maine (n=131)					
10th Percentile and Below	13	Minimum	-58.4%	Minimum	-58.4%
10th to 25th Percentile	20	-58.4%	-51.8%	-58.4%	-51.9%
25th to 50th Percentile	33	-51.8%	-43.4%	-51.9%	-43.5%
50th to 75th Percentile	33	-43.4%	-28.4%	-43.5%	-28.4%
75th to 90th Percentile	20	-28.4%	-7.0%	-28.4%	-7.0%
Above 90th Percentile	13	-7.0%	Maximum	-7.0%	Maximum
New Hampshire (n=60)					
10th Percentile and Below	6	Minimum	-67.2%	Minimum	-68.2%
10th to 25th Percentile	9	-67.2%	-56.4%	-68.2%	-57.6%
25th to 50th Percentile	15	-56.4%	-44.1%	-57.6%	-45.1%
50th to 75th Percentile	15	-44.1%	-35.3%	-45.1%	-37.0%
75th to 90th Percentile	9	-35.3%	-17.6%	-37.0%	-20.1%
Above 90th Percentile	6	-17.6%	Maximum	-20.1%	Maximum
New Jersey (n=45)					
10th Percentile and Below	5	Minimum	-17.6%	Minimum	-18.7%
10th to 25th Percentile	7	-17.6%	-14.4%	-18.7%	-14.4%
25th to 50th Percentile	11	-14.4%	-8.0%	-14.4%	-8.0%
50th to 75th Percentile	11	-8.0%	-3.7%	-8.0%	-5.1%
75th to 90th Percentile	7	-3.7%	-1.4%	-5.1%	-2.3%
Above 90th Percentile	5	-1.4%	Maximum	-2.3%	Maximum
New York/Connecticut (n = 95)					
10th Percentile and Below	10	Minimum	-40.7%	Minimum	-41.6%
10th to 25th Percentile	14	-40.7%	-30.1%	-41.6%	-30.1%
25th to 50th Percentile	24	-30.1%	-17.0%	-30.1%	-17.0%
50th to 75th Percentile	24	-17.0%	-6.2%	-17.0%	-6.2%
75th to 90th Percentile	14	-6.2%	-1.4%	-6.2%	-1.0%
Above 90th Percentile	10	-1.4%	Maximum	-1.0%	Maximum

Table 214 - Proportional change in gross revenue by home port state for Alternative 3/4 and 4A

		Alternative 3/4		Alternative 4A	
Home Port State	Number of Vessels	Lower	Upper	Lower	Upper
Rhode Island (n=96)					
10th Percentile and Below	10	Minimum	-45.6%	Minimum	-45.6%
10th to 25th Percentile	14	-45.6%	-33.2%	-45.6%	-33.2%
25th to 50th Percentile	24	-33.2%	-19.7%	-33.2%	-19.0%
50th to 75th Percentile	24	-19.7%	-9.7%	-19.0%	-9.7%
75th to 90th Percentile	14	-9.7%	-2.8%	-9.7%	-2.1%
Above 90th Percentile	10	-2.8%	Maximum	-2.1%	Maximum
All Other (n=25)					
10th Percentile and Below	3	Minimum	-40.6%	Minimum	-40.6%
10th to 25th Percentile	4	-40.6%	-16.3%	-40.6%	-14.6%
25th to 50th Percentile	6	-16.3%	-8.5%	-14.6%	-8.5%
50th to 75th Percentile	6	-8.5%	-4.9%	-8.5%	-4.9%
75th to 90th Percentile	4	-4.9%	-1.2%	-4.9%	-1.2%
Above 90th Percentile	3	-1.2%	Maximum	-1.2%	Maximum

Table 214 - Proportional change in gross revenue by home port state for Alternative 3/4 and 4A(cont.)

Impacts by Port Groups

Across ports or port groups median estimated revenue losses exceeded 50% in the ports of Gloucester, Portland, and Boston. This means that half of all vessels in these three port groups would lose more than half of annual fishing revenue under either Alternative 3/4 or 4A. Median revenue losses were lower in the port groups of Chatham/Harwich, New Bedford, New Hampshire Seacoast, Portsmouth, Provincetown, and Upper Mid-Coast Maine, but still were at least 44%. By contrast, median vessel revenue losses in Eastern Long Island and Point Judith were 13.5% and 26.1% respectively. (Table 215)

		Alternative 3/4		Alternative 4A	
Port Group	Number of Vessels	Lower	Upper	Lower	Upper
Boston (n=20)					
25th Percentile and Below	5	Minimum	-56.0%	Minimum	-56.0%
25th to 50th Percentile	5	-56.0%	-50.8%	-56.0%	-51.8%
50th to 75th Percentile	5	-50.8%	-18.4%	-51.8%	-18.4%
Above 75th Percentile	5	-18.4%	Maximum	-18.4%	Maximum
Chatham/Harwich (n=50)					
25th Percentile and Below	13	Minimum	-57.4%	Minimum	-56.8%
25th to 50th Percentile	13	-57.4%	-46.1%	-56.8%	-46.1%
50th to 75th Percentile	13	-46.1%	-35.0%	-46.1%	-36.2%
Above 75th Percentile	13	-35.0%	Maximum	-36.2%	Maximum
Eastern Long Island (n=40)					
25th Percentile and Below	10	Minimum	-25.3%	Minimum	-25.3%
25th to 50th Percentile	10	-25.3%	-13.5%	-25.3%	-13.5%
50th to 75th Percentile	10	-13.5%	-3.8%	-13.5%	-3.8%
Above 75th Percentile	10	-3.8%	Maximum	-3.8%	Maximum
Gloucester (n=97)					
25th Percentile and Below	24	Minimum	-65.5%	Minimum	-63.9%
25th to 50th Percentile	24	-65.5%	-53.5%	-63.9%	-53.5%
50th to 75th Percentile	24	-53.5%	-36.6%	-53.5%	-39.5%
Above 75th Percentile	24	-36.6%	Maximum	-39.5%	Maximum
New Bedford (n=96)					
25th Percentile and Below	24	Minimum	-57.3%	Minimum	-55.1%
25th to 50th Percentile	24	-57.3%	-45.2%	-55.1%	-44.6%
50th to 75th Percentile	24	-45.2%	-29.0%	-44.6%	-28.6%
Above 75th Percentile	24	-29.0%	Maximum	-28.6%	Maximum
New Hampshire Seacoast (n=32)					
25th Percentile and Below	8	Minimum	-57.5%	Minimum	-59.8%
25th to 50th Percentile	8	-57.5%	-45.0%	-59.8%	-46.1%
50th to 75th Percentile	8	-45.0%	-32.7%	-46.1%	-33.8%
Above 75th Percentile	8	-32.7%	Maximum	-33.8%	Maximum
Point Judith (n=49)					
25th Percentile and Below	12	Minimum	-36.9%	Minimum	-36.9%
25th to 50th Percentile	12	-36.9%	-26.1%	-36.9%	-26.1%
50th to 75th Percentile	12	-26.1%	-10.7%	-26.1%	-10.7%
Above 75th Percentile	12	-10.7%	Maximum	-10.7%	Maximum

Table 215 – Proportional change in gross annual revenues by port group for Alternative 3/4 and 4A

		Alternative 3/4		Alternative 4A	
Port Group	Number of Vessels	Lower	Upper	Lower	Upper
Portland (n=39)					
25th Percentile and Below	10	Minimum	-57.1%	Minimum	-57.1%
25th to 50th Percentile	10	-57.1%	-50.8%	-57.1%	-51.0%
50th to 75th Percentile	10	-50.8%	-42.8%	-51.0%	-43.0%
Above 75th Percentile	10	-42.8%	Maximum	-43.0%	Maximum
Portsmouth (n=26)					
25th Percentile and Below	7	Minimum	-51.5%	Minimum	-51.6%
25th to 50th Percentile	7	-51.5%	-43.2%	-51.6%	-43.5%
50th to 75th Percentile	7	-43.2%	-35.8%	-43.5%	-37.3%
Above 75th Percentile	7	-35.8%	Maximum	-37.3%	Maximum
Provincetown (n=19)					
25th Percentile and Below	5	Minimum	-53.0%	-53.2%	-53.2%
25th to 50th Percentile	5	-53.0%	-46.6%	-46.8%	-46.8%
50th to 75th Percentile	5	-46.6%	-37.7%	-37.7%	-37.7%
Above 75th Percentile	5	-37.7%	Maximum	0.0%	Maximum
South Shore Massachusetts (n=37)					
25th Percentile and Below	9	Minimum	-49.1%	Minimum	-52.7%
25th to 50th Percentile	9	-49.1%	-37.3%	-52.7%	-37.6%
50th to 75th Percentile	9	-37.3%	-21.5%	-37.6%	-22.9%
Above 75th Percentile	9	-21.5%	Maximum	-22.9%	Maximum
Upper Mid-Coast Maine (n=19)					
25th Percentile and Below	5	Minimum	-52.6%	Minimum	-52.6%
25th to 50th Percentile	5	-52.6%	-47.4%	-52.6%	-47.4%
50th to 75th Percentile	5	-47.4%	-41.5%	-47.4%	-41.8%
Above 75th Percentile	5	-41.5%	Maximum	-41.8%	Maximum
Other (n=325)					
25th Percentile and Below	81	Minimum	-37.1%	Minimum	-37.8%
25th to 50th Percentile	81	-37.1%	-19.2%	-37.8%	-19.3%
50th to 75th Percentile	81	-19.2%	-7.1%	-19.3%	-7.1%
Above 75th Percentile	81	-7.1%	Maximum	-7.1%	Maximum

Table 215 – Proportional change in gross annual revenues by port group for Alternative 3/4 and 4A(cont.)

5.4.4.6 Impacts on Vessel Fishing Revenue of Hard TAC Alternatives 4 and 4A with a 2009 Rebuilding Date

The Council considered an alternative that would rebuild many stocks by 2009. Because fishing mortality must be lower in order to achieve this goal, the economic impacts differ from those previously described. The impacts of this rebuilding date were estimated for the hard TAC alternative.

The economic impact of adopting a rebuilding time frame that would achieve rebuilding targets by 2009 was evaluated using the Closed Area Model where all management measures for Alternative 4 were specified along with the TACs that would be required for a constant fishing mortality rate rebuilding strategy.

Total estimated impacts on gross fishing revenue were $72 million; an increase in short term impact of $12 million compared to Alternative 4 with a 2014 rebuilding time frame. At a vessel-level median revenue losses would be 44.5% while ten-percent of all vessels would lose at least 75.6% of annual fishing revenue (Table 216).

		Alternative 4 at 2009 Rebuild	
	Number of Vessels	Lower	Upper
10th Percentile and Below	85	Minimum	-75.6%
10th to 25th Percentile	127	-75.6%	-65.2%
25th to 50th Percentile	212	-65.2%	-44.5%
50th to 75th Percentile	212	-44.5%	-18.0%
75th to 90th Percentile	127	-18.0%	-6.8%
Above 90th Percentile	85	-6.8%	Maximum

Table 216 - Fleet-wide impacts of Alternative 4 with 2009 rebuild TACs

Impact by Dependence on Groundfish

The impact on vessels revenue increases with relative dependence on groundfish. The median impacts for vessels that rely on groundfish for three-quarters or more of annual revenue (-68.3%) would be almost ten times that of vessels that rely on groundfish for less than one-quarter of annual revenue (-7.1%), (Table 217). Estimated median vessel impacts were -25.2% and -45.7% respectively for vessels with 25 to 50% dependence and vessels with 50% to 75% dependence on groundfish.

		Alternative 4 at 2009 Rebuild	
Dependence on Groundfish	Number of Vessels	Lower	Upper
Less than 25% (n = 182)			
10th Percentile and Below	18	Minimum	-17.2%
10th to 25th Percentile	27	-17.2%	-12.6%
25th to 50th Percentile	46	-12.6%	-7.1%
50th to 75th Percentile	46	-7.1%	-3.0%
75th to 90th Percentile	27	-3.0%	-0.7%
Above 90th Percentile	18	-0.7%	Maximum
25 to less than 50% (n = 142)			
10th Percentile and Below	14	Minimum	-37.0%
10th to 25th Percentile	21	-37.0%	-31.8%
25th to 50th Percentile	36	-31.8%	-25.2%
50th to 75th Percentile	36	-25.2%	-18.3%
75th to 90th Percentile	21	-18.3%	-11.8%
Above 90th Percentile	14	-11.8%	Maximum
50% to less than 75% (n = 153)			
10th Percentile and Below	15	Minimum	-58.0%
10th to 25th Percentile	23	-58.0%	-50.6%
25th to 50th Percentile	38	-50.6%	-45.7%
50th to 75th Percentile	38	-45.7%	-39.0%
75th to 90th Percentile	23	-39.0%	-29.3%
Above 90th Percentile	15	-29.3%	Maximum
75% or Greater (n = 371)			
10th Percentile and Below	37	Minimum	-83.2%
10th to 25th Percentile	56	-83.2%	-74.8%
25th to 50th Percentile	93	-74.8%	-68.3%
50th to 75th Percentile	93	-68.3%	-58.4%
75th to 90th Percentile	56	-58.4%	-46.3%
Above 90th Percentile	37	-46.3%	Maximum

Table 217 - Revenue impacts by dependency on groundfish for Alternative 4 with 2009 rebuild TACs

Impact by Entity Size in Terms of Gross Sales

Estimated impact on annual fishing revenue would be at least -52.7% for all vessels at or below the 25th percentile within each sales interval (Table 218). Median vessel impacts would be lower for vessels with less than $35 thousand in groundfish sales as compared to vessels with higher sales while revenue impacts on vessels were higher at all percentiles for vessels with groundfish sales of between $100 and $250 thousand. Thus, 197 vessels within this sales interval would be disproportionately affected relative to all others.

		Alternative 4 at 2009 Rebuild	
Gross Groundfish Sales Intervals	Number of Vessels	Lower	Upper
$35,000 or less (n = 209)			
10th Percentile and Below	21	Minimum	-74.9%
10th to 25th Percentile	31	-74.9%	-52.7%
25th to 50th Percentile	52	-52.7%	-18.3%
50th to 75th Percentile	52	-18.3%	-5.9%
75th to 90th Percentile	31	-5.9%	-1.5%
Above 90th Percentile	21	-1.5%	Maximum
$35,001 to $100,000 (n = 245)			
10th Percentile and Below	25	Minimum	-76.2%
10th to 25th Percentile	37	-76.2%	-67.9%
25th to 50th Percentile	61	-67.9%	-44.9%
50th to 75th Percentile	61	-44.9%	-21.5%
75th to 90th Percentile	37	-21.5%	-9.8%
Above 90th Percentile	25	-9.8%	Maximum
$100,001 to $250,000 (n = 197)			
10th Percentile and Below	21	Minimum	-80.3%
10th to 25th Percentile	31	-80.3%	-68.4%
25th to 50th Percentile	47	-68.4%	-55.4%
50th to 75th Percentile	47	-55.4%	-36.4%
75th to 90th Percentile	31	-36.4%	-14.1%
Above 90th Percentile	21	-14.1%	Maximum
$250,001 or more (n = 187)			
10th Percentile and Below	19	Minimum	-72.8%
10th to 25th Percentile	28	-72.8%	-65.8%
25th to 50th Percentile	47	-65.8%	-48.4%
50th to 75th Percentile	47	-48.4%	-26.7%
75th to 90th Percentile	28	-26.7%	-11.3%
Above 90th Percentile	19	-11.3%	Maximum

Table 218 - Revenue impacts by gross sales of groundfish for Alternative 4 with 2009 rebuild TACs

Impact by Gear Groups

Across gear groups gillnet gear would be disproportionately affected compared to hook gear and would be disadvantaged relative to trawl vessels at all percentiles up to and including the 75th percentile (Table 219). Compared to trawl gear, hook gear would also be more disadvantaged up to the 25th percentile but trawl gear revenue impacts would exceed hook impacts at the 50th percentile and above.

		Alternative 4 at 2009 Rebuild	
		Lower	Upper
Gillnet Gear (n= 181)	Number of Vessels		
10th Percentile and Below	18	Minimum	-83.6%
10th to 25th Percentile	27	-83.6%	-76.1%
25th to 50th Percentile	45	-76.1%	-53.0%
50th to 75th Percentile	45	-53.0%	-19.8%
75th to 90th Percentile	27	-19.8%	-5.3%
Above 90th Percentile	18	-5.3%	Maximum
Hook Gear (n=75)			
10th Percentile and Below	8	Minimum	-79.2%
10th to 25th Percentile	11	-79.2%	-65.3%
25th to 50th Percentile	19	-65.3%	-40.6%
50th to 75th Percentile	19	-40.6%	-9.8%
75th to 90th Percentile	11	-9.8%	-1.6%
Above 90th Percentile	8	-1.6%	Maximum
Trawl Gear (n=592)			
10th Percentile and Below	59	Minimum	-72.2%
10th to 25th Percentile	89	-72.2%	-62.2%
25th to 50th Percentile	148	-62.2%	-42.2%
50th to 75th Percentile	148	-42.2%	-18.8%
75th to 90th Percentile	89	-18.8%	-7.7%
Above 90th Percentile	59	-7.7%	Maximum

Table 219 - Proportional change in gross annual revenues by gear group for Alternative 4 with 2009 rebuild TACs

Impact by Vessel Length Class

Among vessels of differing lengths medium vessels would be comparatively more disadvantaged than large vessels at all percentiles (Table 220). Small vessels would be most impacted at the 10th percentile (-79.2%), would incur about the same revenue loss as medium vessels (-68.6%) at the 25th percentile, but would be less affected than medium vessels at all other percentiles.

		Alternative 4 at 2009 Rebuild	
Large (n=190)	Number of Vessels	Lower	Upper
10th Percentile and Below	19	Minimum	-67.2%
10th to 25th Percentile	29	-67.2%	-58.5%
25th to 50th Percentile	48	-58.5%	-31.5%
50th to 75th Percentile	48	-31.5%	-11.8%
75th to 90th Percentile	29	-11.8%	-5.9%
Above 90th Percentile	19	-5.9%	Maximum
Medium (n=485)			
10th Percentile and Below	49	Minimum	-77.3%
10th to 25th Percentile	73	-77.3%	-68.5%
25th to 50th Percentile	121	-68.5%	-49.4%
50th to 75th Percentile	121	-49.4%	-21.3%
75th to 90th Percentile	73	-21.3%	-7.6%
Above 90th Percentile	49	-7.6%	Maximum
Small (n=173)			
10th Percentile and Below	17	Minimum	-79.2%
10th to 25th Percentile	26	-79.2%	-68.6%
25th to 50th Percentile	43	-68.6%	-39.3%
50th to 75th Percentile	43	-39.3%	-15.0%
75th to 90th Percentile	26	-15.0%	-3.9%
Above 90th Percentile	17	-3.9%	Maximum

Table 220 - Proportional change in gross annual revenues by vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 4 with 2009 rebuild TACs

Impact by Gear/Length Groups

Estimated revenue impacts on small hook vessels would be greater than larger hook vessels at the 10^{th} percentile, the 75^{th} percentile and the 90^{th} percentile but would be less affected at the 25^{th} and 50^{th} percentile (Table 221). Gillnet vessels would be similarly affected up to the 25^{th} percentile regardless of size but larger gillnet vessels would be comparatively more affected at the median and all other percentiles. For trawl gear, both small and medium trawl vessels would be similarly affected as there were only minor differences in estimated revenue impacts at all percentiles. While estimated impacts were still substantial for large trawlers (at least one-third for half of the fleet) they were lower than estimated revenue impacts on smaller trawl vessels.

		Alternative 4 at 2009 Rebuild	
Small Hook (n=51)	Number of Vessels	Lower	Upper
10th Percentile and Below	5	Minimum	-79.2%
10th to 25th Percentile	8	-79.2%	-63.9%
25th to 50th Percentile	13	-63.9%	-37.5%
50th to 75th Percentile	13	-37.5%	-14.3%
75th to 90th Percentile	8	-14.3%	-3.9%
Above 90th Percentile	5	-3.9%	Maximum
0.0%			
Large Hook (n=24)			
10th Percentile and Below	2	Minimum	-75.3%
10th to 25th Percentile	4	-75.3%	-70.1%
25th to 50th Percentile	6	-70.1%	-54.7%
50th to 75th Percentile	6	-54.7%	-5.7%
75th to 90th Percentile	4	-5.7%	-1.4%
Above 90th Percentile	2	-1.4%	Maximum
0.0%			
Small Trawl (n=187)			
10th Percentile and Below	19	Minimum	-74.6%
10th to 25th Percentile	28	-74.6%	-66.5%
25th to 50th Percentile	47	-66.5%	-48.4%
50th to 75th Percentile	47	-48.4%	-19.9%
75th to 90th Percentile	28	-19.9%	-7.7%
Above 90th Percentile	19	-7.7%	Maximum
Medium Trawl (n=218)			
10th Percentile and Below	22	Minimum	-72.2%
10th to 25th Percentile	33	-72.2%	-63.8%
25th to 50th Percentile	55	-63.8%	-45.9%
50th to 75th Percentile	55	-45.9%	-23.4%
75th to 90th Percentile	33	-23.4%	-10.7%
Above 90th Percentile	22	-10.7%	Maximum
Large Trawl (n=187)			
10th Percentile and Below	19	Minimum	-67.8%
10th to 25th Percentile	28	-67.8%	-58.5%
25th to 50th Percentile	47	-58.5%	-30.9%
50th to 75th Percentile	47	-30.9%	-11.8%
75th to 90th Percentile	28	-11.8%	-5.8%
Above 90th Percentile	19	-5.8%	Maximum

Table 221 - Proportional change in gross annual revenues by gear group and vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 4 with 2009 Rebuild TACs

		Alternative 4 at 2009 Rebuild	
	Number of Vessels	Lower	Upper
Small Gillnet (n=63)			
10th Percentile and Below	6	Minimum	-82.4%
10th to 25th Percentile	9	-82.4%	-75.2%
25th to 50th Percentile	16	-75.2%	-44.6%
50th to 75th Percentile	16	-44.6%	-16.2%
75th to 90th Percentile	9	-16.2%	-3.2%
Above 90th Percentile	6	-3.2%	Maximum
Medium Gillnet (n=118)			
10th Percentile and Below	12	Minimum	-84.1%
10th to 25th Percentile	18	-84.1%	-78.1%
25th to 50th Percentile	30	-78.1%	-56.7%
50th to 75th Percentile	30	-56.7%	-19.8%
75th to 90th Percentile	18	-19.8%	-5.9%
Above 90th Percentile	12	-5.9%	Maximum

Table 221 - Proportional change in gross annual revenues by gear group and vessel size (Large = +70'; Medium = 50 to 70', Small = Under 50') for Alternative 4 with 2009 Rebuild TACs

Impacts by Home Port State

The relative distribution of revenue impacts was slightly higher for Maine as compared to Massachusetts vessels at all percentiles (Table 222). Overall relative revenue impacts were higher for New Hampshire vessels than any other state with median vessel revenue losses of 62.8% as compared to -53.8% and
-58.2% in Massachusetts and Maine, respectively. New Jersey vessels would incur the lowest reduction in annual fishing revenue while the distribution of impacted vessels in Rhode Island was similar to that of New York/Connecticut.

		Alternative 4 at 2009 Rebuild	
Home Port State	**Number of Vessels**	**Lower**	**Upper**
Massachusetts (n=396)			
10th Percentile and Below	40	Minimum	-78.2%
10th to 25th Percentile	59	-78.2%	-70.2%
25th to 50th Percentile	99	-70.2%	-53.8%
50th to 75th Percentile	99	-53.8%	-29.7%
75th to 90th Percentile	59	-29.7%	-13.5%
Above 90th Percentile	40	-13.5%	Maximum
Maine (n=131)			
10th Percentile and Below	13	Minimum	-79.3%
10th to 25th Percentile	20	-79.3%	-69.0%
25th to 50th Percentile	33	-69.0%	-58.2%
50th to 75th Percentile	33	-58.2%	-34.0%
75th to 90th Percentile	20	-34.0%	-7.7%
Above 90th Percentile	13	-7.7%	Maximum
New Hampshire (n=60)			
10th Percentile and Below	6	Minimum	-83.1%
10th to 25th Percentile	9	-83.1%	-76.8%
25th to 50th Percentile	15	-76.8%	-62.8%
50th to 75th Percentile	15	-62.8%	-45.9%
75th to 90th Percentile	9	-45.9%	-30.8%
Above 90th Percentile	6	-30.8%	Maximum
New Jersey (n=45)			
10th Percentile and Below	5	Minimum	-29.6%
10th to 25th Percentile	7	-29.6%	-19.0%
25th to 50th Percentile	11	-19.0%	-13.5%
50th to 75th Percentile	11	-13.5%	-6.1%
75th to 90th Percentile	7	-6.1%	-3.5%
Above 90th Percentile	5	-3.5%	Maximum
New York/Connecticut (n = 95)			
10th Percentile and Below	10	Minimum	-50.3%
10th to 25th Percentile	14	-50.3%	-36.6%
25th to 50th Percentile	24	-36.6%	-21.9%
50th to 75th Percentile	24	-21.9%	-8.8%
75th to 90th Percentile	14	-8.8%	-2.5%
Above 90th Percentile	10	-2.5%	Maximum

Table 222 - Proportional change in gross revenue by home port state for Alternative 4 with 2009 rebuild TACs

		Alternative 4 at 2009 Rebuild	
Home Port State	**Number of Vessels**	**Lower**	**Upper**
Rhode Island (n=96)			
10th Percentile and Below	10	Minimum	-52.6%
10th to 25th Percentile	14	-52.6%	-40.4%
25th to 50th Percentile	24	-40.4%	-25.4%
50th to 75th Percentile	24	-25.4%	-11.1%
75th to 90th Percentile	14	-11.1%	-5.9%
Above 90th Percentile	10	-5.9%	Maximum
All Other (n=25)			
10th Percentile and Below	3	Minimum	-49.1%
10th to 25th Percentile	4	-49.1%	-16.0%
25th to 50th Percentile	6	-16.0%	-9.4%
50th to 75th Percentile	6	-9.4%	-6.1%
75th to 90th Percentile	4	-6.1%	-2.3%
Above 90th Percentile	3	-2.3%	Maximum

Table 222 - Proportional change in gross revenue by home port state for Alternative 4 with 2009 rebuild TACs

Impacts by Port Groups

Estimated median revenue reductions would be approximately 70% or more in both the Gloucester, and Portland port groups (Table 223). Median revenue losses would be at least 50% in most other port groups (Boston, Chatham/Harwich, New Hampshire Seacoast, Portsmouth, Provincetown, and Upper Mid-Coast Maine) and would be at least 42% in both New Bedford and South Shore Massachusetts. Estimated median revenue impacts would be lower in both the Eastern Long Island and Point Judith port groups. Note that this does not necessarily mean that all vessels in either of these port groups would be less impacted than all other vessels in all other port groups since the most impacted Point Judith vessel may be as affected as the most affected vessels in any other port group.

		Alternative 4 at 2009 Rebuild	
Port Group	Number of Vessels	Lower	Upper
Boston (n=20)			
25th Percentile and Below	5	Minimum	-65.8%
25th to 50th Percentile	5	-65.8%	-57.0%
50th to 75th Percentile	5	-57.0%	-19.8%
Above 75th Percentile	5	-19.8%	Maximum
Chatham/Harwich (n=50)			
25th Percentile and Below	13	Minimum	-70.6%
25th to 50th Percentile	13	-70.6%	-61.5%
50th to 75th Percentile	13	-61.5%	-45.6%
Above 75th Percentile	13	-45.6%	Maximum
Eastern Long Island (n=40)			
25th Percentile and Below	10	Minimum	-30.9%
25th to 50th Percentile	10	-30.9%	-16.2%
50th to 75th Percentile	10	-16.2%	-6.6%
Above 75th Percentile	10	-6.6%	Maximum
Gloucester (n=97)			
25th Percentile and Below	24	Minimum	-76.2%
25th to 50th Percentile	24	-76.2%	-71.2%
50th to 75th Percentile	24	-71.2%	-57.1%
Above 75th Percentile	24	-57.1%	Maximum
New Bedford (n=96)			
25th Percentile and Below	24	Minimum	-60.4%
25th to 50th Percentile	24	-60.4%	-41.6%
50th to 75th Percentile	24	-41.6%	-27.9%
Above 75th Percentile	24	-27.9%	Maximum
New Hampshire Seacoast (n=32)			
25th Percentile and Below	8	Minimum	-73.0%
25th to 50th Percentile	8	-73.0%	-61.6%
50th to 75th Percentile	8	-61.6%	-44.5%
Above 75th Percentile	8	-44.5%	Maximum
Point Judith (n=49)			
25th Percentile and Below	12	Minimum	-45.2%
25th to 50th Percentile	12	-45.2%	-29.8%
50th to 75th Percentile	12	-29.8%	-12.0%
Above 75th Percentile	12	-12.0%	Maximum

Table 223 - Proportional change in gross annual revenues by port group for Alternative 4 with 2009 rebuild TACs

		Alternative 4 at 2009 Rebuild	
Port Group	**Number of Vessels**	**Lower**	**Upper**
Portland (n=39)			
25th Percentile and Below	10	Minimum	-73.0%
25th to 50th Percentile	10	-73.0%	-69.9%
50th to 75th Percentile	10	-69.9%	-61.6%
Above 75th Percentile	10	-61.6%	Maximum
Portsmouth (n=26)			
25th Percentile and Below	7	Minimum	-80.0%
25th to 50th Percentile	7	-80.0%	-65.0%
50th to 75th Percentile	7	-65.0%	-44.5%
Above 75th Percentile	7	-44.5%	Maximum
Provincetown (n=19)			
25th Percentile and Below	5	Minimum	-59.7%
25th to 50th Percentile	5	-59.7%	-53.9%
50th to 75th Percentile	5	-53.9%	-41.5%
Above 75th Percentile	5	-41.5%	Maximum
South Shore Massachusetts (n=37)			
25th Percentile and Below	9	Minimum	-69.9%
25th to 50th Percentile	9	-69.9%	-46.7%
50th to 75th Percentile	9	-46.7%	-31.5%
Above 75th Percentile	9	-31.5%	Maximum
Upper Mid-Coast Maine (n=19)			
25th Percentile and Below	5	Minimum	-66.4%
25th to 50th Percentile	5	-66.4%	-57.2%
50th to 75th Percentile	5	-57.2%	-48.5%
Above 75th Percentile	5	-48.5%	Maximum
Other (n=325)			
25th Percentile and Below	81	Minimum	-49.7%
25th to 50th Percentile	81	-49.7%	-24.7%
50th to 75th Percentile	81	-24.7%	-9.5%
Above 75th Percentile	81	-9.5%	Maximum

Table 223 - Proportional change in gross annual revenues by port group for Alternative 4 with 2009 rebuild TACs

5.4.4.7 Comparison of Impacts on Vessel Fishing Revenues Across Alternatives

Alternatives 2A, 2B, and 3 would not meet conservation objectives without a hard TAC as either a primary or as a backstop measure. Alternative 1B would meet the year 1 conservation objectives for the phased effort reduction program but the economic analysis of Alternative 1B only reflect the first year of a four-year phase-in of DAS reductions and is thus not directly comparable to other alternatives. Alternatives that do not meet conservation requirements would have lower economic impact but to compare these ineffective alternatives to ones that are effective would be misleading. Therefore, even though results are presented for all alternatives comparisons across alternatives in the remaining discussion will focus only on versions of alternatives that meet conservation requirements.

Among effective alternatives the Proposed Action would have lowest aggregate loss in total fishing revenue ($40.1 million) while Alternative 2 with the backstop hard TAC would have largest estimated loss of revenue ($64.2 million) (Table 224). The economic impact of the Proposed Action is partially offset by efficiency gains due to the larger increase in the GOM cod trip limit as well as the omission of the October-November closure of blocks 148-155 that are included in Alternative 2. Further, the Proposed Action includes several unique measures that could mitigate some of the estimated impacts (DAS leasing and DAS transfer, sector allocation, and potential use of Category B DAS. While either leasing or sector allocation could have been combined with any of the non-selected alternatives the potential revenue gains that may be captured with the use of either Reserve or Regular B DAS is unique to the Proposed Action.

Among the quota-based alternatives, Alternative 2 would result in highest revenue impact for vessels below the median but that estimated median impacts were similar for all TAC-based alternatives. For the most part, vessels that are comparatively more impacted under Alternative 2 had a higher dependence on Georges Bank cod as the trip limit for Alternative 2 is 500 pounds per DAS as compared to 2,000 pounds per DAS for Alternatives 4/3 and 4A.

Impact by Dependence on Groundfish

Overall, the Proposed Action would have lowest impact on gross annual fishing revenue regardless of level of dependence on groundfish (Table 225). However, the relative distribution of estimated revenue impacts were only modestly lower than Alternative 1A. The difference between the Proposed Action and all other Alternatives is accentuated at levels of groundfish dependence of 50% or more. For example, median impact on vessels that rely on groundfish for 75% of more of annual fishing revenue was -35% for the Proposed Action as compared to -56.1%, -53.0% and -53.1% for Alternatives 2, 4/3, and 4A respectively.

Across all alternatives with a hard TAC, Alternative 2 had the largest deleterious revenue impact. As noted previously, Alternative 2 disproportionately affects vessels with a high dependence on Georges Bank cod (hook and gillnet gears in particular); not strictly due to the hard TAC but because of the more restrictive trip limit. For vessels with little or no dependence on Georges Bank cod, the relative impact across any of the TAC-based alternatives would not appreciably differ.

	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
10th Percentile	-46.3%	-29.8%	-48.8%	-34.2%	-38.8%	-40.9%	-69.4%	-17.1%	-63.2%	-63.2%	-40.4%
25th Percentile	-40.1%	-25.4%	-42.2%	-28.0%	-26.1%	-26.0%	-55.2%	-12.6%	-51.8%	-51.8%	-34.3%
50th Percentile	-24.0%	-14.7%	-25.6%	-16.9%	-13.6%	-13.8%	-37.1%	-4.4%	-35.4%	-36.2%	-19.6%
75th Percentile	-7.2%	-3.0%	-8.8%	-4.9%	-2.3%	-2.5%	-14.4%	0.0%	-13.8%	-13.9%	-5.4%
90th Percentile	0.0%	0.6%	0.0%	0.2%	0.5%	0.4%	-4.6%	3.6%	-4.6%	-4.9%	0.0%
Total Revenue Loss ($ million)	$45.6	$28.3	$49.1	$33.0	$31.6	$30.2	$64.2	$14.6	$59.9	$59.9	$40.10

Table 224 - Fleet-Wide Impacts by Alternative

Dependence on Groundfish	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
Less than 25% (n = 182)											
10th Percentile	-11.6%	-10.4%	-12.2%	-10.4%	-8.2%	-8.2%	-14.2%	-6.9%	-13.6%	-13.8%	-9.5%
25th Percentile	-8.0%	-5.5%	-8.2%	-5.7%	-3.9%	-4.1%	-9.8%	-2.5%	-9.6%	-9.7%	-6.6%
50th Percentile	-3.2%	-2.1%	-3.6%	-2.5%	-0.9%	-1.0%	-5.8%	0.0%	-5.8%	-5.8%	-2.5%
75th Percentile	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-1.9%	0.3%	-1.9%	-2.1%	0.0%
90th Percentile	0.5%	0.6%	0.3%	0.4%	1.2%	1.2%	-0.1%	2.6%	-0.1%	-0.1%	0.4%
25 to less than 50% (n = 142)											
10th Percentile	-27.4%	-22.7%	-27.4%	-22.8%	-19.5%	-19.5%	-32.7%	-12.4%	-30.9%	-30.4%	-21.0%
25th Percentile	-20.9%	-15.4%	-21.7%	-16.8%	-12.0%	-12.0%	-27.2%	-5.6%	-25.8%	-25.5%	-16.7%
50th Percentile	-17.1%	-10.9%	-17.8%	-11.8%	-5.6%	-5.5%	-19.4%	-2.3%	-18.9%	-19.0%	-13.2%
75th Percentile	-12.2%	-7.2%	-13.3%	-8.4%	-0.1%	-0.1%	-13.5%	0.4%	-12.7%	-13.1%	-10.1%
90th Percentile	-2.6%	0.0%	-6.7%	-0.9%	1.6%	2.1%	-9.5%	4.5%	-9.3%	-9.4%	-0.2%
50% to less than 75% (n = 153)											
10th Percentile	-39.6%	-33.0%	-40.3%	-33.2%	-37.4%	-37.4%	-56.9%	-20.5%	-52.4%	-50.7%	-32.0%
25th Percentile	-33.2%	-21.7%	-34.8%	-24.0%	-24.6%	-25.6%	-47.0%	-10.1%	-44.3%	-44.1%	-27.6%
50th Percentile	-28.9%	-17.6%	-29.7%	-19.0%	-14.6%	-14.6%	-38.6%	-5.6%	-36.6%	-36.6%	-23.1%
75th Percentile	-21.3%	-10.8%	-22.7%	-13.7%	-6.5%	-8.3%	-31.2%	0.0%	-30.2%	-31.2%	-16.3%
90th Percentile	-7.2%	0.0%	-9.5%	-2.6%	-1.9%	-2.0%	-21.6%	5.6%	-24.2%	-21.9%	-3.1%
75% or Greater (n = 371)											
10th Percentile	-50.0%	-33.8%	-54.8%	-43.6%	-62.6%	-62.6%	-77.7%	-21.1%	-70.9%	-69.7%	-45.2%
25th Percentile	-45.5%	-28.1%	-48.1%	-32.1%	-34.0%	-34.5%	-66.9%	-15.2%	-61.3%	-61.5%	-40.0%
50th Percentile	-41.1%	-24.9%	-43.2%	-27.5%	-24.5%	-24.8%	-56.1%	-11.5%	-53.0%	-53.1%	-35.0%
75th Percentile	-33.3%	-16.4%	-36.1%	-20.9%	-18.1%	-17.3%	-46.4%	-2.2%	-44.4%	-44.7%	-27.2%
90th Percentile	0.0%	5.1%	-8.1%	2.7%	-6.6%	-7.1%	-35.6%	4.2%	-34.7%	-37.4%	0.0%

Table 225 - Revenue Impacts by Dependency on Groundfish by Alternative

Impact by Entity Size in Terms of Gross Sales

Impacts on estimated annual fishing revenue were consistently lowest for both the Proposed Action and Alternative 1A at nearly all percentiles and all levels of groundfish sales, but in particular at levels of groundfish sales of $100 thousand or less (Table 226). , For vessels with groundfish sales above $100 thousand the revenue impacts up to the 50th percentile were consistently lowest for the Proposed Action by at least six percentage points when compared to all alternatives except 1A. However, the estimated impacts at the 75th percentile and above (i.e. vessels with lower estimated revenue changes) were similar across all alternatives. Thus, for about 11% of all vessels (all of which had annual groundfish sales of more than $100 thousand and would experience least revenue change within a given sales interval) the revenue impacts were approximately the same with either a large DAS reduction or a hard TAC. For the remaining 89% of the groundfish fleet the revenue impacts would be lower with a DAS reduction alternative than a TAC-based alternative.

Impact by Gear Groups

The Proposed Action would have least revenue impact on both gillnet and hook vessels (Table 227). Compared to the other TAC alternatives (4/3 and 4A) Alternative 2 would have greatest impact on hook and gillnet vessels dependent on Georges Bank cod (note estimated impacts at the 25th percentile and below). By contrast, the relative distribution of impacts was similar across TAC-based alternatives for both gear groups at the 50th percentile and above.

Trawl vessels would be less affected under the Proposed Action at all percentiles. However, among the least affected trawl vessels (at the 75th percentile and above) the difference in estimated revenue impact between the Proposed Action, Alternative 1A and all alternatives with a hard TAC were negligible.

Gross Groundfish Sales Intervals	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
$35,000 or less (n = 209)											
10th Percentile	-28.0%	-19.5%	-29.2%	-24.0%	-37.7%	-37.7%	-63.8%	-17.4%	-61.0%	-62.9%	-27.1%
25th Percentile	-11.4%	-7.1%	-13.3%	-10.8%	-14.3%	-13.5%	-39.5%	-3.5%	-37.3%	-39.8%	-9.8%
50th Percentile	-1.2%	0.0%	-2.8%	-1.2%	-0.8%	-0.8%	-12.9%	0.0%	-12.8%	-13.4%	-1.2%
75th Percentile	0.3%	0.6%	0.0%	0.4%	0.2%	0.2%	-3.5%	0.7%	-3.4%	-3.5%	0.3%
90th Percentile	18.9%	19.3%	18.5%	18.9%	4.2%	4.2%	-0.5%	6.3%	-0.5%	-0.5%	18.5%
$35,001 to $100,000 (n = 245)											
10th Percentile	-46.3%	-32.4%	-48.1%	-33.8%	-43.7%	-49.1%	-72.5%	-21.5%	-67.5%	-66.6%	-38.4%
25th Percentile	-35.2%	-23.2%	-37.2%	-23.9%	-26.9%	-29.2%	-54.7%	-10.5%	-52.6%	-53.1%	-26.9%
50th Percentile	-20.9%	-12.8%	-21.5%	-13.9%	-11.7%	-12.9%	-37.2%	-3.6%	-35.5%	-36.7%	-15.7%
75th Percentile	-8.8%	-2.9%	-9.5%	-5.1%	-3.7%	-3.9%	-17.0%	0.1%	-16.8%	-16.4%	-6.2%
90th Percentile	-1.0%	2.3%	-2.1%	1.0%	0.0%	-0.1%	-8.0%	4.5%	-8.0%	-8.0%	0.0%
$100,001 to $250,000 (n = 197)											
10th Percentile	-47.7%	-30.2%	-50.1%	-38.6%	-50.9%	-50.0%	-70.3%	-14.5%	-59.7%	-60.1%	-42.0%
25th Percentile	-42.8%	-26.6%	-45.4%	-29.4%	-26.4%	-30.8%	-54.9%	-11.3%	-48.9%	-48.9%	-36.4%
50th Percentile	-34.8%	-20.6%	-37.1%	-23.6%	-17.2%	-17.6%	-42.4%	-4.7%	-39.7%	-39.7%	-29.0%
75th Percentile	-21.0%	-11.4%	-23.6%	-14.5%	-6.5%	-6.5%	-27.4%	0.0%	-25.5%	-26.1%	-17.3%
90th Percentile	-11.0%	-4.7%	-11.2%	-7.0%	-0.9%	-0.7%	-12.1%	5.0%	-11.7%	-11.7%	-8.7%
$250,001 or more (n = 187)											
10th Percentile	-47.1%	-29.8%	-50.5%	-38.6%	-34.5%	-30.9%	-66.1%	-17.2%	-61.3%	-61.4%	-42.6%
25th Percentile	-44.5%	-27.3%	-47.5%	-31.9%	-29.7%	-25.8%	-59.0%	-15.2%	-55.8%	-55.4%	-39.4%
50th Percentile	-39.4%	-24.4%	-42.5%	-27.5%	-22.8%	-20.1%	-49.9%	-12.5%	-46.4%	-46.6%	-34.9%
75th Percentile	-26.7%	-16.7%	-28.0%	-18.4%	-12.4%	-11.8%	-30.5%	-5.9%	-27.0%	-26.7%	-22.4%
90th Percentile	-15.6%	-9.6%	-16.6%	-11.1%	-4.8%	-2.8%	-11.9%	-0.7%	-10.7%	-10.7%	-13.8%

Table 226 - Revenue Impacts by Gross Sales of Groundfish by Alternative

Gillnet Gear (n= 181)	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
10th Percentile	-46.6%	-27.2%	-51.5%	-39.4%	-56.9%	-56.9%	-75.9%	-15.4%	-59.7%	-61.5%	-43.5%
25th Percentile	-34.9%	-19.3%	-42.5%	-26.2%	-27.5%	-25.6%	-51.0%	-10.4%	-46.5%	-47.8%	-33.9%
50th Percentile	-12.0%	-2.9%	-14.3%	-7.2%	-12.9%	-13.6%	-34.0%	-0.8%	-33.0%	-34.8%	-9.7%
75th Percentile	0.0%	0.6%	-0.2%	0.3%	-0.2%	-0.3%	-13.9%	0.5%	-13.4%	-13.4%	0.2%
90th Percentile	11.6%	18.5%	11.6%	17.1%	0.7%	0.6%	-2.9%	7.7%	-2.9%	-2.5%	13.0%
Hook Gear (n=75)											
10th Percentile	-37.7%	-24.3%	-44.1%	-31.9%	-73.7%	-73.7%	-78.5%	-5.3%	-60.5%	-59.8%	-41.9%
25th Percentile	-19.9%	-3.1%	-24.0%	-19.3%	-54.7%	-54.7%	-61.0%	0.0%	-45.6%	-45.6%	-21.9%
50th Percentile	0.0%	0.0%	-7.7%	-3.0%	-9.7%	-9.7%	-34.3%	0.0%	-29.0%	-33.4%	-7.7%
75th Percentile	3.4%	3.9%	1.9%	3.6%	0.5%	0.5%	-6.7%	1.5%	-5.5%	-6.2%	2.7%
90th Percentile	29.2%	29.2%	29.2%	29.2%	6.3%	6.3%	-0.1%	14.1%	-0.1%	-0.1%	29.2%
Trawl Gear (n=592)											
10th Percentile	-46.4%	-30.6%	-48.8%	-33.5%	-33.4%	-33.6%	-66.7%	-17.2%	-63.9%	-64.0%	-40.2%
25th Percentile	-41.4%	-26.4%	-43.0%	-28.5%	-24.8%	-25.3%	-55.6%	-13.6%	-53.6%	-53.6%	-34.8%
50th Percentile	-29.5%	-18.7%	-30.3%	-20.1%	-13.7%	-14.1%	-38.1%	-6.5%	-37.0%	-37.2%	-22.7%
75th Percentile	-14.1%	-9.2%	-14.1%	-9.7%	-3.5%	-3.5%	-15.7%	-0.8%	-15.2%	-15.2%	-10.3%
90th Percentile	-4.7%	-2.7%	-4.7%	-2.8%	0.0%	0.0%	-6.1%	2.6%	-6.1%	-6.1%	-3.0%

Table 227 - Proportional Change in Gross Annual Revenues by Gear Group by Alternative

Impact by Vessel Length Class
Estimated revenue impacts on both medium and small vessels would be lower under the Proposed Action than they would be for either Alternative 1A, Alternative 2, 4/3, or 4A (Table 228). This difference in impact is greatest for small vessels since many of these vessels would use either gillnet or hook gear which would benefit proportionally more from the higher GOM and GB cod trip limit under Alternative 1A as compared to the trip limits under other alternatives.

Medium vessels would also be less affected under Proposed Action but the difference between the Proposed Action and Alternative 1A and other alternatives is not quite as substantial as compared to small vessels particularly for vessels at or above the 75th percentile. Similarly, the relative distribution of estimated revenue impacts on large vessels differed by no more than four percentage points at the 50th, 75th and 90th percentiles. Thus, the impact on annual fishing revenue for half of large vessels would be approximately the same under either an alternative with a large DAS reduction or a hard TAC with a lower reduction in DAS. By contrast, the other half of large vessels would be less affected by the DAS reduction under Proposed Action than they would be under the hard TAC of Alternatives 2, 4/3, or 4A.

Impact by Gear/Length Groups
Both hook and gillnet vessels would be less affected under Proposed Action than any of the hard TAC alternatives regardless of vessel size (Table 229). This is also the case for small trawl vessels. However, both medium and large trawl vessels would be similarly affected across all effective alternatives at the median and above. Among the most affected medium and large trawl vessels (the 25th and 10th percentiles) the estimated revenue changes were lower for Proposed Action or for Alternative 1A than they were for Alternatives 2, 4/3, and 4A.

Large (n=190)	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
10th Percentile	-46.3%	-29.0%	-49.8%	-33.2%	-33.3%	-29.2%	-63.9%	-15.9%	-58.7%	-58.7%	-41.4%
25th Percentile	-42.3%	-26.2%	-45.2%	-30.1%	-24.9%	-22.8%	-54.8%	-13.7%	-51.5%	-51.7%	-37.2%
50th Percentile	-29.4%	-18.0%	-30.2%	-19.5%	-12.7%	-12.1%	-32.2%	-6.8%	-30.0%	-30.0%	-24.3%
75th Percentile	-14.6%	-9.2%	-15.7%	-10.6%	-3.3%	-2.9%	-12.2%	-1.5%	-10.8%	-10.8%	-11.6%
90th Percentile	-4.4%	-3.3%	-4.4%	-3.3%	0.1%	0.2%	-5.0%	2.6%	-4.5%	-4.5%	-3.6%
Medium (n=485)											
10th Percentile	-46.6%	-30.8%	-48.5%	-33.2%	-36.1%	-40.3%	-69.6%	-17.2%	-64.1%	-63.2%	-40.2%
25th Percentile	-41.0%	-26.4%	-43.0%	-30.1%	-26.0%	-27.6%	-55.4%	-12.6%	-52.6%	-52.2%	-34.7%
50th Percentile	-29.2%	-18.1%	-30.3%	-19.5%	-14.4%	-14.7%	-40.1%	-5.2%	-37.6%	-38.2%	-22.5%
75th Percentile	-12.8%	-6.1%	-13.5%	-10.6%	-3.6%	-3.4%	-16.8%	0.0%	-16.8%	-16.8%	-8.6%
90th Percentile	0.0%	0.0%	-0.4%	-3.3%	0.1%	0.1%	-5.7%	3.1%	-5.6%	-5.7%	0.0%
Small (n=173)											
10th Percentile	-40.3%	-25.1%	-44.7%	-30.6%	-58.8%	-58.8%	-75.7%	-19.5%	-63.8%	-64.2%	-38.1%
25th Percentile	-21.3%	-11.4%	-24.0%	-18.3%	-31.4%	-34.5%	-58.5%	-6.6%	-47.3%	-47.2%	-21.7%
50th Percentile	-5.5%	-0.3%	-9.2%	-4.2%	-8.7%	-9.4%	-32.7%	0.0%	-29.0%	-31.2%	-4.8%
75th Percentile	0.0%	1.0%	0.0%	0.5%	0.0%	0.0%	-11.3%	0.6%	-11.0%	-11.1%	0.2%
90th Percentile	19.3%	23.7%	18.5%	23.7%	1.6%	1.1%	-2.4%	6.9%	-2.4%	-2.5%	23.3%

Table 228 - Proportional Change in Gross Annual Revenues by Vessel Size (Large = +70'; Medium = 50 to 70', Small = Under 50') by Alternative

Small Hook (n=51)	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
10th Percentile	-34.1%	-24.3%	-44.1%	-35.6%	-80.4%	-80.4%	-86.7%	-5.3%	-60.6%	-60.6%	-42.9%
25th Percentile	-19.5%	-2.8%	-24.0%	-21.3%	-54.9%	-54.9%	-61.0%	0.0%	-43.6%	-44.5%	-27.2%
50th Percentile	0.0%	0.0%	-9.4%	-7.7%	-27.5%	-27.5%	-34.3%	0.0%	-27.5%	-33.4%	-10.8%
75th Percentile	3.4%	3.6%	1.9%	3.2%	0.0%	0.0%	-9.7%	0.9%	-7.2%	-7.7%	2.7%
90th Percentile	29.2%	29.2%	29.2%	29.2%	3.2%	3.2%	-0.6%	4.2%	-0.6%	-0.8%	29.2%
Above 90th Percentile											
Large Hook (n=24)											
10th Percentile	-37.7%	-23.5%	-37.9%	-24.1%	-60.8%	-60.8%	-70.4%	-2.1%	-58.8%	-52.2%	-31.9%
25th Percentile	-25.6%	-6.1%	-26.6%	-12.7%	-39.1%	-36.0%	-62.5%	-0.3%	-48.5%	-47.2%	-17.9%
50th Percentile	0.0%	0.0%	-1.3%	0.0%	-1.3%	-1.3%	-32.7%	0.0%	-32.7%	-37.2%	-0.6%
75th Percentile	3.9%	5.6%	3.8%	5.6%	2.6%	2.6%	-1.9%	2.9%	-1.9%	-2.9%	3.9%
90th Percentile	20.3%	20.3%	20.3%	20.3%	19.3%	19.3%	-0.1%	19.3%	-0.1%	-0.1%	20.3%
Above 90th Percentile											
Small Trawl (n=187)											
10th Percentile	-47.0%	-31.5%	-47.1%	-32.0%	-35.1%	-41.5%	-70.4%	-22.5%	-67.8%	-66.3%	-37.9%
25th Percentile	-38.9%	-26.1%	-39.7%	-26.3%	-26.3%	-30.5%	-58.1%	-13.2%	-56.2%	-57.6%	-30.9%
50th Percentile	-24.8%	-14.8%	-25.3%	-14.8%	-13.4%	-16.3%	-41.3%	-5.0%	-41.3%	-41.4%	-17.4%
75th Percentile	-9.1%	-4.6%	-9.1%	-4.7%	-2.2%	-2.6%	-15.9%	0.0%	-15.9%	-15.2%	-5.0%
90th Percentile	-1.0%	0.0%	-1.0%	0.0%	0.0%	0.0%	-6.1%	2.6%	-6.1%	-6.1%	0.0%
Above 90th Percentile											
Medium Trawl (n=218)											
10th Percentile	-46.6%	-32.8%	-48.8%	-33.7%	-32.4%	-32.4%	-66.1%	-17.2%	-63.7%	-63.2%	-40.4%
25th Percentile	-41.9%	-26.9%	-43.1%	-28.4%	-23.5%	-25.2%	-55.3%	-13.6%	-53.1%	-53.2%	-34.9%
50th Percentile	-32.1%	-21.6%	-33.8%	-22.6%	-15.0%	-14.5%	-38.4%	-6.6%	-37.7%	-37.7%	-25.4%
75th Percentile	-19.0%	-12.8%	-19.3%	-13.4%	-4.8%	-4.5%	-19.1%	-1.2%	-19.0%	-19.0%	-13.2%
90th Percentile	-10.2%	-6.2%	-10.2%	-6.3%	-0.1%	0.0%	-7.9%	3.1%	-8.0%	-8.0%	-7.1%
Above 90th Percentile											

Table 229 - Proportional Change in Gross Annual Revenues by Gear Group and Vessel Size (Large = +70'; Medium = 50 to 70', Small = Under 50') by Alternative

Small Hook (n=51)	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
Large Trawl (n=187)											
10th Percentile	-46.4%	-29.1%	-49.9%	-33.4%	-33.4%	-29.5%	-63.8%	-16.0%	-63.7%	-58.5%	-41.5%
25th Percentile	-42.3%	-26.2%	-45.2%	-30.1%	-24.9%	-23.0%	-54.8%	-13.7%	-51.5%	-51.7%	-37.2%
50th Percentile	-29.3%	-18.0%	-30.3%	-19.9%	-12.6%	-12.4%	-31.9%	-7.0%	-29.8%	-29.8%	-24.4%
75th Percentile	-14.6%	-9.2%	-15.7%	-10.6%	-2.9%	-2.8%	-12.2%	-1.5%	-10.8%	-10.8%	-11.6%
90th Percentile	-4.4%	-3.3%	-4.4%	-3.3%	0.2%	0.2%	-4.7%	2.6%	-4.1%	-4.1%	-3.6%
Above 90th Percentile											
Small Gillnet (n=63)											
10th Percentile	-40.3%	-23.4%	-51.9%	-38.5%	-57.7%	-57.7%	-76.4%	-16.1%	-58.5%	-64.0%	-42.0%
25th Percentile	-17.7%	-4.1%	-19.0%	-13.1%	-25.2%	-25.2%	-53.5%	-5.2%	-51.5%	-53.5%	-15.5%
50th Percentile	-2.6%	0.0%	-2.9%	0.0%	-6.0%	-6.0%	-30.7%	0.0%	-29.8%	-31.2%	-0.2%
75th Percentile	9.3%	12.7%	9.3%	12.3%	0.2%	0.0%	-9.5%	1.4%	-10.8%	-9.8%	11.6%
90th Percentile	29.7%	29.7%	29.7%	29.7%	1.3%	0.9%	-2.4%	11.1%	-4.1%	-2.5%	31.4%
Above 90th Percentile											
Medium Gillnet (n=118)											
10th Percentile	-47.8%	-27.7%	-51.5%	-43.2%	-56.9%	-56.9%	-75.9%	-15.4%	-66.5%	-59.6%	-45.2%
25th Percentile	-39.8%	-21.6%	-46.1%	-28.4%	-29.0%	-25.6%	-49.4%	-10.9%	-49.1%	-47.0%	-37.2%
50th Percentile	-18.8%	-10.2%	-24.3%	-14.3%	-14.4%	-14.4%	-34.5%	-1.7%	-28.5%	-34.9%	-18.2%
75th Percentile	-1.5%	0.0%	-4.0%	-0.2%	-2.4%	-2.8%	-14.6%	0.4%	-9.5%	-13.9%	0.0%
90th Percentile	1.7%	4.6%	0.5%	3.2%	0.4%	0.4%	-2.9%	5.9%	-2.4%	-2.9%	3.2%
Above 90th Percentile											

Table 229 - Proportional Change in Gross Annual Revenues by Gear Group and Vessel Size (Large = +70'; Medium = 50 to 70', Small = Under 50') by Alternative (cont.)

Impacts by Home Port State
Vessels with a Maine, Massachusetts, or New Hampshire homeport would be less affected under the Proposed Action than they would be under Alternative 1A or a hard TAC. This difference was particularly large for Alternative 2 for Massachusetts vessels because comparatively more vessels from Massachusetts are disproportionately affected by the Georges Bank cod trip limit proposed under Alternative 2 (Table 230.

For vessels from either Rhode Island or New York/Connecticut the relative impacts were similar at all percentiles across all effective alternatives (Proposed Action, 1A, 2, 4/3, and 4A). Only New Jersey vessels would have lower revenue impacts under a hard TAC as compared to Proposed Action.

Impacts by Port Groups
Across port groups estimated annual revenue losses for vessels with home ports of Gloucester, New Hampshire Seacoast, Chatham/Harwich, Portland, Portsmouth, Provincetown, South Shore Massachusetts, and Upper Mid-Coast Maine would be lower under Proposed Action than under Alternative 1A or any of the alternatives that include a hard TAC (Table 231). Revenue impacts at and below the median on vessels with either a Boston or a New Bedford homeport would be lower for Proposed Action but would not be substantially different at the 75th percentile and above. Estimated revenue impacts on vessels from either Point Judith or Eastern Long Island port groups would be approximately the same under Proposed Action, Alternative 1A or Alternatives 2, 4/3, or 4A.

Home Port State	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
Massachusetts (n=396)											
10th Percentile	-47.8%	-29.8%	-51.3%	-38.1%	-58.8%	-58.8%	-75.9%	-18.1%	-68.8%	-67.6%	-43.4%
25th Percentile	-42.4%	-26.0%	-45.7%	-30.0%	-33.9%	-33.5%	-64.7%	-13.6%	-58.5%	-58.4%	-38.0%
50th Percentile	-29.7%	-17.3%	-32.4%	-21.1%	-23.2%	-22.3%	-50.1%	-5.6%	-45.8%	-45.8%	-26.2%
75th Percentile	-8.0%	-1.9%	-11.5%	-6.6%	-11.1%	-10.0%	-29.5%	0.1%	-27.4%	-27.3%	-8.9%
90th Percentile	1.2%	3.6%	0.2%	2.6%	0.0%	0.0%	-11.5%	5.7%	-10.8%	-10.7%	1.7%
Maine (n=131)											
10th Percentile	-45.9%	-28.2%	-47.5%	-29.4%	-27.2%	-30.9%	-60.8%	-15.6%	-58.4%	-58.4%	-38.0%
25th Percentile	-42.5%	-26.3%	-43.4%	-26.6%	-21.2%	-23.9%	-52.7%	-13.7%	-51.8%	-51.9%	-35.0%
50th Percentile	-36.1%	-21.8%	-36.1%	-21.9%	-13.6%	-14.8%	-44.0%	-7.0%	-43.4%	-43.5%	-29.0%
75th Percentile	-10.5%	-3.6%	-10.5%	-3.8%	-1.1%	-3.4%	-28.5%	0.0%	-28.4%	-28.4%	-6.5%
90th Percentile	0.0%	0.0%	0.0%	0.0%	0.4%	0.1%	-7.0%	2.5%	-7.0%	-7.0%	0.0%
New Hampshire (n=60)											
10th Percentile	-47.2%	-30.2%	-48.0%	-30.6%	-39.9%	-44.3%	-67.7%	-31.0%	-67.2%	-68.2%	-39.7%
25th Percentile	-38.2%	-24.5%	-41.0%	-26.7%	-30.1%	-30.1%	-57.8%	-16.0%	-56.4%	-57.6%	-34.3%
50th Percentile	-18.6%	-14.1%	-19.0%	-17.6%	-20.4%	-21.1%	-46.3%	-7.9%	-44.1%	-45.1%	-16.9%
75th Percentile	-5.2%	3.6%	-5.2%	3.6%	-5.4%	-4.5%	-36.0%	-1.7%	-35.3%	-37.0%	0.6%
90th Percentile	25.2%	25.2%	22.5%	24.9%	0.7%	0.2%	-17.5%	4.1%	-17.6%	-20.1%	22.5%
New Jersey (n=45)											
10th Percentile	-26.4%	-21.1%	-27.9%	-21.1%	-9.3%	-13.0%	-19.6%	-7.5%	-17.6%	-18.7%	
25th Percentile	-19.0%	-14.3%	-19.7%	-14.5%	-5.8%	-5.5%	-14.4%	-3.4%	-14.4%	-14.4%	-17.8%
50th Percentile	-13.5%	-9.2%	-14.1%	-9.5%	-1.2%	-1.2%	-7.9%	-0.1%	-8.0%	-8.0%	-13.1%
75th Percentile	-6.1%	-3.5%	-6.1%	-5.7%	0.2%	0.2%	-3.9%	0.4%	-3.7%	-5.1%	-9.7%
90th Percentile	-1.9%	0.0%	-1.9%	-1.9%	2.8%	2.8%	-1.7%	3.3%	-1.4%	-2.3%	-3.9%

Table 230 - Proportional Change in Gross Revenue by Home Port State by Alternative

Home Port State	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
New York/Connecticut (n = 95)											-1.2%
10th Percentile	-46.3%	-35.4%	-48.1%	-35.6%	-20.7%	-20.7%	-40.7%	-17.9%	-40.7%	-41.6%	-38.0%
25th Percentile	-31.9%	-25.1%	-34.0%	-26.7%	-12.2%	-11.2%	-30.1%	-9.0%	-30.1%	-30.1%	-22.5%
50th Percentile	-17.6%	-13.6%	-17.6%	-13.6%	-3.8%	-3.3%	-16.9%	-2.6%	-17.0%	-17.0%	-12.5%
75th Percentile	-6.1%	-3.7%	-6.1%	-4.0%	-0.1%	-0.1%	-6.8%	0.0%	-6.2%	-6.2%	-3.3%
90th Percentile	0.0%	0.0%	-0.1%	0.0%	0.0%	0.6%	-1.4%	2.3%	-1.4%	-1.0%	0.0%
Rhode Island (n=96)											
10th Percentile	-42.8%	-33.7%	-43.1%	-35.2%	-17.2%	-21.4%	-46.6%	-14.4%	-45.6%	-45.6%	-33.6%
25th Percentile	-34.1%	-23.6%	-35.2%	-26.8%	-10.9%	-8.8%	-35.2%	-7.3%	-33.2%	-33.2%	-25.2%
50th Percentile	-19.8%	-13.2%	-21.1%	-14.7%	-5.3%	-2.5%	-19.3%	-3.1%	-19.7%	-19.0%	-15.6%
75th Percentile	-9.6%	-6.7%	-9.8%	-7.3%	-0.2%	-0.4%	-10.1%	0.1%	-9.7%	-9.7%	-6.3%
90th Percentile	-3.1%	0.0%	-3.1%	0.0%	0.7%	1.6%	-2.9%	3.1%	-2.8%	-2.1%	0.0%
All Other (n=25)											
10th Percentile	-39.1%	-24.8%	-44.0%	-30.5%	-28.3%	-21.4%	-40.6%	-14.9%	-40.6%	-40.6%	-32.0%
25th Percentile	-16.7%	-10.3%	-17.8%	-11.1%	-8.8%	-8.8%	-17.6%	-5.7%	-16.3%	-14.6%	-14.6%
50th Percentile	-8.8%	-5.5%	-8.8%	-5.6%	-2.5%	-2.5%	-8.8%	-2.1%	-8.5%	-8.5%	-7.1%
75th Percentile	-4.3%	-2.7%	-4.4%	-2.8%	-0.4%	-0.4%	-5.4%	0.0%	-4.9%	-4.9%	-3.6%
90th Percentile	0.0%	0.0%	0.0%	0.0%	1.6%	1.6%	-1.2%	2.3%	-1.2%	-1.2%	0.0%

Table 230 - Proportional Change in Gross Revenue by Home Port State by Alternative (cont.)

Port Group	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
Boston (n=20)											
25th Percentile	-43.0%	-26.2%	-45.7%	-31.3%	-30.2%	-25.0%	-60.3%	-14.1%	-56.0%	-56.0%	-39.3%
50th Percentile	-38.6%	-23.8%	-40.6%	-26.7%	-22.5%	-16.8%	-55.7%	-9.2%	-50.8%	-51.8%	-33.4%
75th Percentile	-15.5%	-7.6%	-14.6%	-8.4%	-7.1%	-6.0%	-18.9%	1.4%	-18.4%	-18.4%	-11.0%
Chatham/Harwich (n=50)											
25th Percentile	-42.9%	-24.3%	-51.5%	-43.6%	-62.6%	-62.6%	-77.0%	-2.7%	-57.4%	-56.8%	-49.3%
50th Percentile	-28.8%	-8.3%	-37.0%	-25.9%	-51.2%	-50.7%	-65.4%	0.0%	-46.1%	-46.1%	-33.0%
75th Percentile	0.0%	0.0%	-18.3%	-13.2%	-29.7%	-29.3%	-49.4%	0.2%	-35.0%	-36.2%	-18.3%
Eastern Long Island (n=40)											
25th Percentile	-22.5%	-17.9%	-22.7%	-18.4%	-12.4%	-11.4%	-25.3%	-9.5%	-25.3%	-25.3%	-18.3%
50th Percentile	-14.2%	-11.6%	-14.2%	-12.5%	-4.5%	-4.5%	-13.8%	-4.0%	-13.5%	-13.5%	-11.0%
75th Percentile	-3.6%	-3.5%	-3.8%	-3.7%	-1.3%	-1.3%	-4.1%	0.0%	-3.8%	-3.8%	-3.5%
Gloucester (n=97)											
25th Percentile	-44.7%	-28.1%	-47.7%	-30.2%	-33.9%	-36.0%	-70.4%	-14.4%	-65.5%	-63.9%	-38.8%
50th Percentile	-36.2%	-18.5%	-39.4%	-20.9%	-26.3%	-25.2%	-56.0%	-6.1%	-53.5%	-53.5%	-28.8%
75th Percentile	-4.7%	0.1%	-5.5%	-1.3%	-7.3%	-8.7%	-37.7%	0.6%	-36.6%	-39.5%	-2.9%
New Bedford (n=96)											
25th Percentile	-43.9%	-27.0%	-47.0%	-31.0%	-29.4%	-25.9%	-61.3%	-14.4%	-57.3%	-55.1%	-38.9%
50th Percentile	-39.6%	-24.4%	-42.3%	-27.5%	-22.2%	-21.2%	-49.9%	-11.9%	-45.2%	-44.6%	-34.7%
75th Percentile	-28.6%	-19.2%	-29.7%	-20.3%	-11.9%	-10.8%	-32.4%	-4.9%	-29.0%	-28.6%	-23.5%
New Hampshire Seacoast (n=32)											
25th Percentile	-30.5%	-22.7%	-32.7%	-24.0%	-30.5%	-31.8%	-58.4%	-20.2%	-57.5%	-59.8%	-29.4%
50th Percentile	-13.4%	-9.6%	-13.4%	-10.2%	-21.3%	-25.5%	-46.4%	-9.1%	-45.0%	-46.1%	-9.8%
75th Percentile	2.4%	11.8%	2.4%	11.8%	-3.4%	-2.9%	-33.0%	-1.2%	-32.7%	-33.8%	5.6%

Table 231 - Proportional Change in Gross Annual Revenues for Port Groups by Alternative

Port Group	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
Point Judith (n=49)											
25th Percentile	-39.1%	-30.3%	-39.4%	-30.3%	-10.3%	-9.4%	-37.6%	-7.1%	-36.9%	-36.9%	-28.5%
50th Percentile	-22.4%	-13.7%	-24.8%	-16.8%	-5.8%	-5.1%	-27.9%	-2.5%	-26.1%	-26.1%	-15.8%
75th Percentile	-13.7%	-9.4%	-13.7%	-10.3%	-0.9%	-0.3%	-12.5%	0.0%	-10.7%	-10.7%	-10.5%
Portland (n=39)											
25th Percentile	-45.9%	-28.2%	-48.0%	-31.7%	-28.0%	-23.9%	-59.5%	-15.8%	-57.1%	-57.1%	-40.0%
50th Percentile	-43.6%	-26.5%	-44.4%	-27.4%	-22.9%	-18.0%	-50.9%	-13.7%	-50.8%	-51.0%	-36.5%
75th Percentile	-36.9%	-22.2%	-37.8%	-22.7%	-15.1%	-13.6%	-44.1%	-7.0%	-42.8%	-43.0%	-29.4%
Portsmouth (n=26)											
25th Percentile	-43.7%	-24.5%	-46.2%	-27.6%	-26.1%	-26.0%	-54.3%	-14.2%	-51.5%	-51.6%	-36.9%
50th Percentile	-29.9%	-19.6%	-31.8%	-20.4%	-21.4%	-20.7%	-46.3%	-8.8%	-43.2%	-43.5%	-25.2%
75th Percentile	-16.2%	-3.2%	-16.8%	-8.2%	-13.1%	-15.8%	-36.4%	-3.7%	-35.8%	-37.3%	-8.2%
Provincetown (n=19)											
25th Percentile	-34.5%	-19.8%	-35.2%	-21.7%	-29.2%	-28.5%	-55.6%	-6.4%	-53.0%	-53.2%	-27.6%
50th Percentile	-23.5%	-13.0%	-25.6%	-13.7%	-21.6%	-22.3%	-47.6%	-3.9%	-46.6%	-46.8%	-21.0%
75th Percentile	-16.4%	-7.2%	-19.8%	-10.1%	-15.7%	-15.0%	-40.1%	0.5%	-37.7%	-37.7%	-12.4%
South Shore Massachusetts (n=37)											
25th Percentile	-36.3%	-22.6%	-36.9%	-23.6%	-37.6%	-36.2%	-58.7%	-11.7%	-49.1%	-52.7%	-29.6%
50th Percentile	-19.7%	-9.6%	-21.7%	-11.4%	-18.4%	-18.4%	-40.2%	0.3%	-37.3%	-37.6%	-16.3%
75th Percentile	5.1%	5.1%	0.3%	0.3%	-3.9%	-7.6%	-21.5%	4.2%	-21.5%	-22.9%	0.3%
Upper Mid-Coast Maine (n=19)											
25th Percentile	-43.1%	-26.4%	-43.1%	-26.8%	-19.8%	-31.9%	-52.7%	-13.2%	-52.6%	-52.6%	-34.8%
50th Percentile	-38.3%	-24.1%	-39.3%	-24.5%	-14.6%	-23.3%	-47.4%	-8.6%	-47.4%	-47.4%	-31.8%
75th Percentile	-30.2%	-19.1%	-30.7%	-20.5%	-0.1%	-6.3%	-41.6%	0.0%	-41.5%	-41.8%	-25.6%

Table 231 - Proportional Change in Gross Annual Revenues for Port Groups by Alternative (cont.)

Port Group	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2 With Hard TAC	Alternative 3	Alternative 4/3	Alternative 4A	Proposed Action
Other (n=325)											
25th Percentile	-29.9%	-19.3%	-31.1%	-21.1%	-15.6%	-16.3%	-38.2%	-9.1%	-37.1%	-37.8%	-23.7%
50th Percentile	-15.4%	-10.0%	-16.4%	-10.7%	-5.5%	-5.0%	-19.5%	-2.3%	-19.2%	-19.3%	-11.4%
75th Percentile	-4.3%	-1.7%	-4.4%	-2.3%	0.0%	0.0%	-7.3%	0.1%	-7.1%	-7.1%	-2.3%

Table 231 - Proportional Change in Gross Annual Revenues for Port Groups by Alternative (cont.)

5.4.5 Days-at-sea Requirements for the Multispecies Fishery

The most direct way to analyze the economic impact of days-at-sea (DAS) reductions would be to estimate impacts on vessel profitability. While information on vessel costs and revenue are available, the coverage on costs is not extensive enough to provide reliable estimates of fishing vessel profitability. Instead, this analysis first estimates the number of DAS needed by vessels of different gear and size classes to cover operating and annual costs before returns are divided among crew and owner. Then, the number of days needed to cover return to labor and owner are estimated. Comparing these DAS requirements with current allocated DAS and knowing the average daily return by vessel class, provides an indication of how close vessels are to being unable to realize adequate returns to labor and the owner, and to pay down debt under new restrictions.

The reason for partitioning DAS requirements this way is because, when faced with lower returns, vessel owners often adjust crew payments. Labor payments on fishing vessels are made on a trip basis with the crew sharing the risk of variable levels of catch. Generally, a crew share formula is used which deducts trip expenses from the revenue received on a trip and then divides the remainder among the crew and the vessel owner (or, the revenue is divided first then certain expenses deducted from the crew's share). The reason for not including a daily labor cost in the calculation of DAS requirements is that crew share formulas are often adjusted, or crew size is reduced, when revenue declines. They may also make other cost-saving adjustments but the risk sharing found in commercial fishing may lead to first making adjustments in crew payments.

With the reduced DAS proposed by Amendment 13, fishing vessel owners will evaluate their ability to meet expenses, crew payments, debts, and an owner's return given their new allocation[2]. Returns from other fisheries will be a factor, but this analysis only considers groundfish DAS requirements. Since groundfish DAS are annual allocations, the DAS requirements are expressed as annual needs.

Crew share payments are made on a trip basis so crew is normally paid before overhead expenses are paid. However, vessel owners are likely to project the effect of reduced DAS on their ability to pay all expenses. The decision to take an individual trip may be based on expected daily return and daily expenses, including crew payment and owner's return. But with limited DAS, the additional return needed to pay overhead expenses should also be considered.

Since crew payments and owner return can be adjusted in response to DAS reductions, this analysis shows the DAS required to meet all non-labor expenses and then treats DAS requirements for labor and owner's return separately. In reality, a vessel owner will decide to get out of fishing long before crew payments and owner's return approach zero (but may continue for the short term if conditions are expected to change). This analysis, however, provides estimates of where returns would equal zero then reports the additional DAS needed to provide a level of crew payments that approximate wages found in alternative shore-side occupations.

5.4.5.1 Data Used to Estimate DAS Requirements

Cost data was collected through surveys of fleet sectors involved in catching groundfish. The University of Rhode Island surveyed the small trawl vessel fleet in 1996 (Lallemand et al. 1998) and the large trawl vessel fleet in 1997 (Lallemand et al. 1999). The University of Massachusetts Dartmouth surveyed the hook fleet in 1996 (Georgianna and Cass 1998). Both surveys were funded through NMFS's Cooperative

[2] Note that ownership arrangement (owner operated vs. hired captain) will impact the return to owner.

Marine Education and Research (CMER) Program and the data provided to NMFS. Cost data for the gillnet fleet comes from economic questions asked by observers on sea sampling trips in 2000. Cost data from 1996-97 was adjusted for inflation with the GDP implicit price deflator and is in 2000 dollars.

The cost surveys collected data on all fishing business costs - both variable and overhead. Variable costs include fuel, oil/lubrication, ice, food/water, bait (where applicable), offloading, consignment, supplies, and other miscellaneous trip costs. Overhead costs include association fees, permits, haul out, insurance, mooring, office expenses, professional fees, business taxes, vehicle, interest, repair/maintenance (includes repairs and maintenance to engines, generators, fishing gear, electronics, and other miscellaneous items), and other miscellaneous overhead expenses. Periodic vessel improvements are not counted in the fixed costs. The variable cost questions asked by observers are limited to fuel, oil/lubrication, ice, food/water, and bait (which is not applicable to gillnet vessels). The only overhead cost question asked by observers is the cost of insurance. For this analysis, overhead costs for gillnet vessels are assumed to be the same as long-line vessels.

Based on the number of observations and the range of vessel sizes in the cost data, the vessels were separated into length classes. There are two length classes for each gear group except trawl vessels which have three length classes. This grouping of vessels by gear and size is unique to the DAS requirements analysis. Further sub-divisions by port or other criteria were not possible due to limited numbers of observations.

Fishing year 2000 (May 2000 through April 2001) revenue data was generated by applying average fish prices from the Northeast Fisheries Science Center (NEFSC) dealer data to logbook trips with groundfish landings. Observations were limited to those vessels with a limited access multispecies permit. Therefore, DAS would have been used on these trips. Revenue from all species was summed for the trip then divided by DAS used to get revenue per DAS. Trips were then categorized by gear type and vessel length class.

5.4.5.2 Overhead DAS Analysis

DAS requirements are estimated in two stages. The first stage estimates DAS requirements for non-labor expenses. Here, a daily return is calculated by subtracting variable costs per day from revenue per day. The software package *BestFit* was used to fit distributions to the cost data[3]. Table 232 shows the distribution names and parameters. Daily returns by vessel group are shown in Table 233.

[3] *BestFit* software is developed by the Palisade Corporation in Newfield, NY.

Vessel Category	Distribution Name	Minimum	Maximum	Mean	Mode	Median	Standard Deviation
Long-line < 40 feet: revenue per day	Not Specified			1,539		1,500	1,088
Variable costs per day	Normal			362	362	362	213
Yearly overhead costs	Triangular	3,824	66,703	26,630	9,362	24,244	14,254
Long-line >= 40 feet: revenue per day	Not specified			1,694		1,175	1,346
Variable costs per day	Lognormal			344	184	279	248
Yearly overhead costs	PearsonV			34,018	25,463	30,578	15,285
Trawl < 50 feet: revenue per day	Not specified			1,407		1,299	761
Variable costs per day	PearsonVI			268	151	216	203
Yearly overhead costs	Beta	1,469	56,526	30,073	33,680	30,384	14,505
Trawl 50 to 70 feet: revenue per day	Not specified			2,195		2,110	939
Variable costs per day	PearsonV			363	251	316	194
Yearly overhead costs	PearsonVI			66,937	20,835	42,894	99,217
Trawl >= 70 feet: revenue per day	Not specified			3,497		3,462	1,671
Variable costs per day	Logistic			814	814	814	376
Yearly overhead costs	Beta	51,831	223,010	135,092	112,312	134,284	47,795
Gillnet < 40 feet: revenue per day	Not specified			1,981		1,678	1,261
Variable costs per day	Lognormal			50	27	41	36
Gillnet >= 40 feet: revenue per day	Not specified			2,285		2,124	1,153
Variable costs per day	Lognormal			94	55	79	63

Table 232 – Revenue and cost distributions (dollars)

Long-line vessels < 40 feet	$1,177
Long-line vessels >= 40 feet	$1,350
Trawl vessels < 50 feet	$1,139
Trawl vessels 50 to 70 feet	$1,832
Trawl vessels >= 70 feet	$2,683
Gillnet vessels < 40 feet	$1,931
Gillnet vessels >= 40 feet	$2,191

Table 233 – Average daily returns by vessel group

Even though crew share payments are a variable cost (paid at the end of a trip based on the catch and expense levels), these costs are not considered in the first stage. The latter part of the first stage divides the yearly overhead costs by the daily return to get the minimum number of DAS needed to cover overhead expenses. These will be referred to as overhead DAS and are reported in Table 234.

The second stage (see Additional DAS Requirements) looks at the return from additional DAS which would go to the crew and owner.

Since a groundfish trip was defined as a trip where at least a pound of groundfish was landed by a vessel with a limited access permit and since revenue from all species was summed for that trip, the number of DAS reported here are what is needed to meet overhead expenses if only allocated multispecies DAS are used. As is the case with many vessels, additional revenue is earned by targeting other species during the year. That activity is not counted here.

5.4.5.3 Additional DAS Requirements

A vessel owner's ability to pay the crew and get a return on his investment (and any principal payments) will be impacted by the new DAS restrictions. To assess how the DAS allocations proposed for Amendment 13 may impact these returns the additional DAS needed to compensate the crew are given in Table 234. For example, the average daily return is $1,177 for long-line vessels less than 40 feet. If an annual salary of $25,000 per crew member (based on the Department of Labor's 2000 National Compensation Survey for shore-side occupations in New England) is assumed and there are two crew members, it would take an additional 42 DAS to meet that wage. Additional days are then required for the owner to receive a return (which may be in addition to the captain's portion of the crew share if the owner is also the captain). The average crew size is also given in Table 234. Adding average overhead DAS and the crew compensation DAS yields an estimate of the point where crew is paid but there is no return to the owner.

There are many different functions performed by crew members which require different sets of skills. Some crew members are employed as deck hands, others as engineers, cooks, and captains. To account for these skill differences, the additional DAS requirements to meet shore-side alternative occupation salary levels was calculated at two additional levels - $35,000 and $50,000 per year (see Table 234). Note that in each case the salary represents an average across all occupations that may be represented on a fishing vessel.

	Average Crew Size Including Captain (min, max)	Average Overhead DAS	Additional DAS Needed for Crew Compensation			Total DAS Requirements		
			$25k	$35k	$50k	$25k	$35k	$50k
Long-line vessels < 40 feet	2 (1, 4)	23	42	59	85	65	82	108
Long-line vessels >= 40 feet	3 (2, 4)	25	56	78	111	81	103	136
Trawl vessels < 50 feet	2 (1, 4)	26	44	61	88	70	87	114
Trawl vessels 50 to 70 feet	3 (1, 7)	37	41	57	82	78	94	119
Trawl vessels >= 70 feet	5 (2, 10)	50	47	65	93	97	115	143
Gillnet vessels < 40 feet	3 (1, 4)	14	39	54	78	53	68	92
Gillnet vessels >= 40 feet	3 (2, 5)	16	34	48	68	50	64	84

Table 234 – DAS requirements to meet overhead and crew compensation

5.4.5.4 Comparison of Alternatives

To compare the DAS allocated to limited access multispecies permit holders against overhead DAS, vessels were re-assigned to a gear group based on which gear (used on groundfish trips) contributed most to annual revenue. This grouping is slightly different from the previous grouping where gear group assignments were based on gear used on a particular trip.

While a strict application of average overhead DAS (as opposed to its distribution) is not advised, comparing allocated and used DAS to overhead DAS can help illustrate the relative financial position of vessel groups. Table 235 shows the average used, and allocated DAS under each alternative by gear and size group. The allocations in Table 235 can then be compared to the average overhead and total DAS requirements reported in Table 234.

To further assess how crew and owners will fare under Amendment 13, Table 236 summarizes the DAS for vessels with allocations greater than overhead DAS.

There appears to be an inconsistency between the additional crew compensation DAS in Table 3 (columns 4-6) and the average used DAS greater than overhead DAS (third column in Table 236). That is, some of the figures in Table 236 are lower than those in Table 234 which seem to indicate that, on average, owners have not been getting a return and crew has been under-compensated. While this may be true in some cases, it is also the case that daily returns from other fisheries have been used to pay fixed expenses and compensations. It should be noted again that the DAS requirements in Table 234 assume no revenue contribution from other fisheries (activity where groundfish DAS are not used).

Vessel owners are likely to decide to get out of fishing for groundfish at a point where returns to crew and owner are inadequate (a point higher than the total DAS requirements reported in Table 234) rather than wait until owner's return is zero. As mentioned above, there may be some adjustments in crew payments which make it difficult to determine that particular point. Certainly, vessels will be unable to continue fishing for groundfish (assuming they are not engaged in other fisheries) if their allocation falls below overhead DAS. There are, however, some vessels that currently have used DAS that are less than overhead DAS. These vessels are most likely relying on revenue from fisheries other than groundfish to meet their overhead expenses, and returns to labor and owner. Therefore, the impacts of DAS reduction should be considered separately from vessels having used DAS above overhead DAS levels. Table 237 shows those vessels with used DAS that already fall under overhead DAS levels.

	Number of Vessels	Average Used DAS 1996 - 2001 (min, max)	Average 2002 DAS (alts 2,3,4) (min, max)	Alternative 1A Avg. DAS (min, max)	Alternative 1B Avg. DAS (min, max)
Long-line vessels < 40 feet	31	57 (0, 88)	46 (8, 70)	26 (5, 40)	37 (7, 57)
Long-line vessels >= 40 feet	17	49 (0, 88)	40 (8, 70)	22 (5, 40)	32 (7, 57)
Trawl vessels < 50 feet	188	60 (0, 148)	49 (8, 118)	27 (5, 67)	39 (7, 96)
Trawl vessels 50 to 70 feet	203	72 (0, 157)	58 (8, 126)	33 (5, 71)	47 (7, 102)
Trawl vessels >= 70 feet	196	91 (0, 164)	73 (8, 131)	41 (5, 74)	59 (7, 107)
Gillnet vessels < 40 feet	69	59 (0, 102)	48 (8, 82)	28 (5,46)	39 (7, 66)
Gillnet vessels >= 40 feet	121	78 (0, 156)	62 (88, 125)	35 (5, 70)	50 (7, 101)

Table 235 – DAS – average used, 2002, and Alternatives 1A and 1B – by vessel group

	Average Used DAS Greater Than Overhead DAS		Average 2002 DAS (alts 2,3,4) Greater Than Overhead DAS		Average Alternative 1A DAS Greater Than Overhead DAS		Average Alternative 1B DAS Greater Than Overhead DAS	
	# of Vessels	DAS (min, max)	# of Vessels	DAS (min, max)	# of Vessels	DAS (min,max)	# of Vessels	DAS (min,max)
Long-line vessels < 40 feet	28	40 (1, 65)	26	30 (0, 47)	20	10 (0, 17)	25	21 (4, 34)
Long-line vessels >= 40 feet	14	33 (2, 63)	11	28 (3, 45)	8	9 (1, 15)	9	22 (5, 32)
Trawl vessels < 50 feet	162	42 (1, 122)	153	30 (0, 92)	109	10 (1, 41)	140	22 (0, 70)
Trawl vessels 50 to 70 feet	172	44 (0, 120)	154	31 (0, 89)	88	7 (0, 34)	142	21 (0, 65)
Trawl vessels >= 70 feet	160	56 (2, 114)	155	36 (2, 81)	66	11 (1, 24)	144	22 (0, 57)
Gillnet vessels < 40 feet	64	50 (8, 88)	64	37 (4, 68)	57	17 (0, 4)	64	27 (1, 52)
Gillnet vessels >= 40 feet	120	62 (1, 140)	118	47 (1, 109)	113	21 (1, 54)	117	36 (5, 85)

Table 236 – Average number of DAS greater than overhead DAS by vessel group

	Number of Vessels	Average Used DAS 1996 - 2001 (min, max)	Average 2002 DAS (alts 2,3,4,) (min, max)	Alternative 1A Avg. DAS (min, max)	Alternative 1B Avg. DAS (min, max)
Long-line vessels < 40 feet	3	2 (0, 3)	8 (8, 8)	5 (5, 5)	7 (7, 7)
Long-line vessels >= 40 feet	3	6 (0, 12)	8 (8, 9)	5 (4, 5)	7 (6, 7)
Trawl vessels < 50 feet	26	12 (0, 24)	12 (8, 19)	7 (5, 11)	10 (7, 15)
Trawl vessels 50 to 70 feet	31	24 (0, 36)	20 (8, 29)	11 (5, 16)	16 (7, 24)
Trawl vessels >= 70 feet	36	23 (0, 47)	20 (8, 37)	11 (5, 21)	16 (7, 30)
Gillnet vessels < 40 feet	5	8 (0, 22)	8 (8, 9)	5 (4, 5)	7 (6, 7)
Gillnet vessels >= 40 feet	1	0	8	5	7

Table 237 – Vessels with used DAS less than overhead DAS, by vessel group

Grouping Vessels by DAS Allocation

Table 238 through Table 241 assign vessels into one of three categories for each alternative (Table 238 is all vessels and Table 239 through Table 241 are vessels dependent on groundfish, that is 50% or more of their revenue is from groundfish). The first category is vessels that have DAS allocations less than overhead DAS. These vessels are considered most at risk since they do not have enough DAS to meet expenses, let alone pay crew salaries, generate owners' returns, or pay off debt.

The second category is vessels with DAS allocations greater than overhead DAS but less than the total DAS requirements. These vessels are also at risk because, while able to pay expenses, they are unable to pay an average crew salary of $25,000, $35,000, or $50,000 per year. While they may be able to negotiate lower crew share payments or reduce crew size, it will be difficult to retain a crew if salaries from alternative occupations become relatively more attractive. This group is also at risk because very little will be left over for a return to the owner.

The third category of vessels may be considered the least at risk since they have enough DAS to cover expenses and pay an average yearly crew salary of $25,000, $35,000, or $50,000. Some vessels are certainly closer to the total DAS requirements point than others and may not be receiving adequate owner returns. Table 238 shows that there are 240 vessels, of which, 237 are dependent on groundfish (see Table 239) with alternatives 2, 3, and 4 (2002 DAS) DAS allocations greater than the total DAS requirements at the $25,000 salary level. Under alternatives 1A and 1B there are 8 and 131 vessels (with all the 1A vessels and 128 of the 1B vessels dependent on groundfish), respectively. Table 240 and Table 241 show the groundfish dependent vessel break-downs at the $35,000 and $50,000 per year levels. As expected, increasing the crew compensation assumptions results in higher total DAS requirements, and therefore, fewer vessels with allocated DAS greater than overhead and total DAS.

DAS Sharing

The discussion above about the financial position of vessels which fall below overhead DAS or total DAS requirements assumes that there will not be a regulatory change that allows for DAS consolidation, DAS leasing or sector shares. Under these kinds of arrangements, the total DAS allocated to a group could remain constant but how the vessels within the group re-allocate DAS could be based on their cost/revenue structure and other financial considerations.

To provide an indication of how DAS sharing could help alleviate some of the financial burden of greater DAS restrictions, the last row in Table 238 through Table 241 shows the total number of DAS over or under total DAS requirements. At the $25,000 salary level (Table 238) there are 3,893 Alternative 2, 3, and 4 DAS above the total DAS requirement. Vessels with allocations less than overhead DAS are short a total of 8,559 DAS and those vessels with allocations between overhead and total DAS are short 8,424 DAS. Even though there are not enough DAS to fully make up the deficit, trading or sharing DAS could help some vessels. Under Alternatives 1A and 1B, however, benefits from DAS sharing would be more difficult to achieve since the DAS over total DAS requirements are significantly less and DAS deficits significantly greater.

Implications of Losing Unused DAS

Some vessel's allocations are greater than what they used in recent years. Even so, the immediate loss in revenue is the difference between revenue from used DAS and revenue from reduced DAS. Losses will continue for each year that DAS are restricted. In cases where all allocated DAS are not used, revenue losses should not be based on reductions from allocated DAS since all revenue potential was not realized. However, it does not mean that there is not a financial impact from losing unused DAS. The DAS associated with a groundfish permit has value since it provides a means for earning revenue. The value of a vessel with a groundfish permit will be worth less, when sold, with fewer associated DAS. This reduction in the value of the vessel and permit is a real financial loss to the vessel owner. However, the reduction in business equity will not affect the short-run decision to continue fishing with fewer DAS. That decision will be based on expected revenues and costs given the new allocations. The purpose for providing estimates of DAS requirements is to show where that decision point may be for different types of vessels.

	Alternative 1A, 1C			Alternative 1B, 1D			Alternatives 2,3,4 (2002 DAS)		
	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements
Long-line vessels < 40 feet	11	20	0	6	25	0	5	19	7
Long-line vessels >= 40 feet	9	8	0	8	9	0	6	11	0
Trawl vessels < 50 feet	79	109	0	48	136	4	35	116	37
Trawl vessels 50 to 70 feet	115	88	0	61	128	14	49	130	24
Trawl vessels >= 70 feet	130	66	0	52	131	13	41	103	52
Gillnet vessels < 40 feet	12	57	0	5	44	20	5	34	30
Gillnet vessels >= 40 feet	8	105	8	4	37	80	3	28	90
Number of DAS Over/(Under) Total DAS Requirements	(21,245)	(12,969)	83	(11,041)	(12,225)	1,149	(8,559)	(8,424)	3,893

Table 238 - Comparison of DAS Allocations to Overhead and Total DAS - All vessels at an annual crew member salary of $25,000

	Alternative 1A, 1C			Alternative 1B, 1D			Alternatives 2,3,4 (2002 DAS)		
	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements
Long-line vessels < 40 feet	11	20	0	6	25	0	5	19	7
Long-line vessels >= 40 feet	8	8	0	7	9	0	5	11	0
Trawl vessels < 50 feet	73	109	0	42	136	4	31	114	37
Trawl vessels 50 to 70 feet	113	88	0	60	127	14	48	129	24
Trawl vessels >= 70 feet	126	66	0	49	130	13	38	102	52
Gillnet vessels < 40 feet	9	51	0	3	38	19	3	28	29
Gillnet vessels >= 40 feet	6	101	8	2	35	78	1	26	88
Number of DAS Over/(Under) Total DAS Requirements	(19,435)	(12,701)	83	(10,123)	(11,925)	1,124	(7,780)	(8,108)	3,792

Table 239 – Comparison of DAS Allocations to Overhead and Total DAS - Vessels dependent on groundfish (50% or more of revenue is from groundfish) and at an annual crew member salary of $25 K

	Alternative 1A, 1C			Alternative 1B, 1D			Alternatives 2,3,4 (2002 DAS)		
	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements
Long-line vessels < 40 feet	11	20	0	6	25	0	5	26	0
Long-line vessels >= 40 feet	8	8	0	7	9	0	5	11	0
Trawl vessels < 50 feet	73	109	0	42	138	2	31	147	4
Trawl vessels 50 to 70 feet	113	88	0	60	138	3	48	138	15
Trawl vessels >= 70 feet	126	66	0	49	143	0	38	134	20
Gillnet vessels < 40 feet	9	51	0	3	57	0	3	57	0
Gillnet vessels >= 40 feet	6	107	2	2	103	10	1	40	74
Number of DAS Over/(Under) Total DAS Requirements	(26,144)	(20,546)	8	(13,050)	(22,037)	227	(10,052)	(17,143)	1,216

Table 240 – Comparison of DAS Allocations to Overhead and Total DAS - Vessels dependent on groundfish (50% or more of revenue is from groundfish) and at an annual crewmember salary of $35 K

	Alternative 1A			Alternative 1B			Alternatives 2,3,4 (2002 DAS)		
	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements	# Vessels w/ DAS < Overhead DAS	# Vessels w/ DAS Between Overhead and Total DAS	# Vessels w/ DAS > Total Requirements
Long-line vessels < 40 feet	11	20	0	6	25	0	5	26	0
Long-line vessels >= 40 feet	8	8	0	7	9	0	5	11	0
Trawl vessels < 50 feet	73	109	0	42	140	0	31	149	2
Trawl vessels 50 to 70 feet	113	88	0	60	141	0	48	151	2
Trawl vessels >= 70 feet	126	66	0	49	143	0	38	154	0
Gillnet vessels < 40 feet	9	51	0	3	57	0	3	57	0
Gillnet vessels >= 40 feet	6	109	0	2	108	5	1	105	9
Number of DAS Over/(Under) Total DAS Requirements	(35,368)	(31,818)	0	(17,561)	(37,847)	40	(13,546)	(33,166)	207

Table 241 – Comparison of DAS Allocations to Overhead and Total DAS - Vessels dependent on groundfish (50% or more of revenue is from groundfish) and at an annual crew member salary of $50 K

5.4.5.5 Management Affects on Fishing Revenue

As mentioned previously, caution should be used when applying averages, and the results from using those averages, to individual vessels. While this analysis provides a broad indication of how vessels may fare under DAS alternatives, individual vessel performance will vary based on actual costs incurred and revenue earned. In particular, the average revenue by vessel class used in the above analysis was based on a gross average across all vessels for each gear/size class. However, since implementation of Amendment 7 a variety of management measures have been implemented affecting the ability to generate fishing revenue. In particular, cod trip limits and rolling closures in the Gulf of Maine have constrained opportunities to generate fishing revenue for vessels that fish in the Gulf of Maine. For example, for fishing year 2000 average revenue per day from the Gulf of Maine was lower than in other areas for all gear/size categories except trawl vessels greater than 70 feet (Table 242).

The differences in revenue potential suggest that vessels that fish exclusively in the Gulf of Maine under prevailing management measures may have had higher DAS requirements than vessels that fish elsewhere given the same overhead and operating cost. Under any of the Amendment 13 alternatives the Gulf of Maine cod trip limit would increase so the difference between revenue opportunities between the Gulf of Maine and Georges Bank may narrow particularly with Alternative 1 (800 pounds vis-a vis 500 pounds per DAS for Alternative 2, 3, and 4). The increased Gulf of Maine cod trip limit would have a greater impact on revenue per day for gillnet and hook vessels as cod represents a larger proportion of fishing revenue compared to trawl gear.

Just as a change in the cod trip limit would improve opportunities to generate fishing revenue in the Gulf of Maine, a reduction in the Georges Bank cod trip limit (Alternatives 2, 1C and 1D) would reduce revenue opportunities for vessels that fish on Georges Bank. As was the case for Gulf of Maine vessels, the impact of a reduction in average revenue per day on break-even DAS would have a larger affect on Georges Bank hook and gillnet vessels as compared to trawlers.

	Revenue per day from the Gulf of Maine	Revenue per day from non-Gulf of Maine areas
Long-line vessels < 40 feet	$1,057	$2,039
Long-line vessels >= 40 feet	$1,444	$2,004
Trawl vessels < 50 feet	$1,329	$1,693
Trawl vessels 50 to 70 feet	$2,114	$2,271
Trawl vessels >= 70 feet	$3,883	$3,541
Gillnet vessels < 40 feet	$1,793	$2,548
Gillnet vessels >= 40 feet	$2,106	$2,448

Table 242 – Revenue per day on Groundfish trips from Gulf of Maine vs. non-Gulf of Maine (FY2000)

5.4.6 Short-term Impacts on Coastal Sub-Regions

An input/output (I/O) model was employed to assess the relative short-term economic losses (sales, personal income, and employment) associated with the proposed management alternatives on the New England regional economy. This approach evolved out of collaborative research between the Marine Policy Center of the Woods Hole Oceanographic Institution and the Northeast Fisheries Science Center as part of a grant received through the Marine Fisheries Initiative (MARFIN) in 1999 (see Marine Policy Center 2000).

The I/O approach provides the ability to estimate how changes in the economic activity of a particular industry will affect other industries from which it purchases and to which it sells goods and services. Thus, in addition to reductions in harvesting revenues, this analysis captures losses associated with the commercial fishing industry buying fewer inputs and the upstream losses that result from less product being available to local seafood dealers and processors. For example, as purchasers of inputs, the commercial fishermen support a number of other industries such as net manufacturers and boat building and repairing. If fishing revenues decline, commercial fishermen demand fewer inputs from these and other supporting industries. In addition, forward linked purchasers of seafood such as seafood dealers and processors may also experience reductions in sales, income, and employment if the management measures result in a diminished supply of local seafood.

The total regional economic effects of the proposed management measures consist of three components: (1) direct, (2) indirect, and (3) induced. In this analysis, direct impacts are considered to be the reductions in sales, income, and employment associated with commercial fishing, seafood dealers, and seafood processors in each of the eleven subregions. Indirect impacts are the associated reductions in sales, income, and employment of all the industries that supply commercial fishermen, seafood dealers, and seafood processors within each of the eleven subregions. These indirectly affected industries, in turn, purchase fewer goods and services from their suppliers and this cycle of reduced purchases continues until the amount remaining within a particular subregion is negligible. Induced impacts represent the reduction in sales, income, and employment attributable to employees of the direct and indirect sectors earning less income. Lower personal income leads to reduced spending on food, housing, entertainment, etc. The summation of the direct, indirect and induced impacts represents total impacts. In the analysis presented here, the total impacts on sales, personal income, and employment are shown for 11 different coastal subregions as well as the non-coastal New England subregion.

Data and Methods

The subregions designated herein were based on several criteria. First and foremost, data particularly on the non-fishing industrial sectors were available only at a county-level. Thus, the subregional impact area designations represent either an individual county or groups of counties within each of the five New England states. Data obtained from Northeast vessel trip reports, Northeast dealer weigh-out slips, Northeast permit applications, and County Business Patterns information on processors were used to classify subregions that have similar economic networks and fishing-related attributes. In general, these data provided the ability to identify the regional distribution channels of seafood as it flows from harvesters through dealers and finally on to processors in New England. Eleven of the twelve subregional designations mainly consist of a coastal county or groups of coastal counties, for these are the counties where the majority of the losses accrue and where the harvesters, dealers, and processors reside (Figure 26, subregions 1-11). A near coastal New England subregion was also included in the analysis to examine the impacts that the proposed management measures will have on businesses located in non-maritime

New England (Figure 26, subregion 12). These subregions generally mirror the community groups identified in the Affected Human Environment (Section 9.4.5).

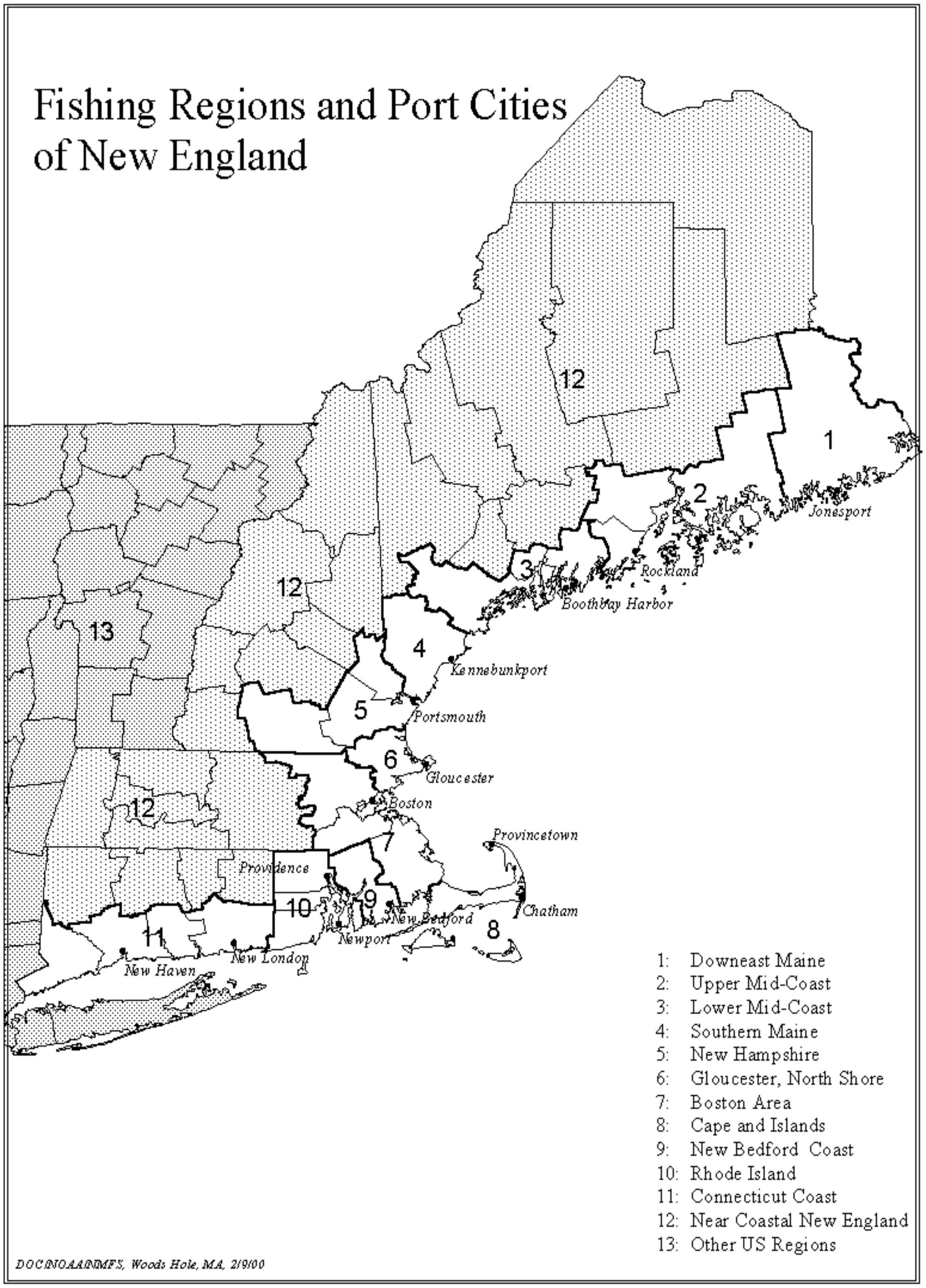


Figure 215 - Map of subregions considered in analyses
Economic analyses exclude subregion 13.

The I/O analysis was constructed using the IMPLAN software system (Minnesota IMPLAN Group, Inc. 1997). The IMPLAN system provides secondary industry data collected from national, state and local government reports and a user-friendly media for customizing I/O models to an application. These regional data were based on calendar year 1998 so all adjustments and the resulting impact estimates are based on 1998 conditions. However, estimated impacts are reported in 2001 dollars using deflators to convert 1998 monetary values to 2001 values.

The default IMPLAN models provide detailed county-level estimates of business activity for up to 528 sectors in each subregion. However, much of these data had to be refined to account for specific features of fishing-related industries. In particular, the five commercial fishing gear sectors that land groundfish in each subregion were incorporated into the default models: bottom longline, gillnet, small trawl, medium trawl, and large trawl vessels. The sales estimates (i.e., ex-vessel revenues) for these sectors were derived from 1998 Northeast dealer weigh-out slips for each subregion except for the Connecticut Seacoast subregion. For Connecticut, data collected from Northeast vessel trip reports on landings by gear type were used to prorate the Northeast dealer data which is reported in aggregate terms across all gears. Fishing cost data for each of the gear sectors were obtained from several sources. First, average fishing costs for small, medium, and large trawlers were obtained from surveys conducted by researchers at the University of Rhode Island in 1996 and 1997 (see Lallemand et al. 1998 and Lallemand et al. 1999). Fishing costs for longline vessels operating in New England were obtained from the University of Massachusetts Dartmouth, which surveyed longline vessels in 1996 (see Georgianna and Cass 1998). Finally, cost data for the gillnet fleet were obtained through the Northeast Fisheries Science Center's sea sampling program in 1997. These data were used to develop production functions for each of the five gear sectors that land groundfish in New England. In I/O models, production functions delineate the proportions of inputs required to produce one dollar of ex-vessel revenue. Employment estimates for the five gear sectors were calculated by prorating the IMPLAN default values for the commercial fishing sectors in each subregion according to ex-vessel revenue shares within each subregion.

Seafood dealer sectors were also incorporated into each subregional model. Total seafood dealer sales within each subregion were estimated from 1998 Northeast dealer weigh-out data. This database provides the origin of seafood purchases by gear type and subregion. Thus, it was possible to determine the quantities of seafood purchased from each gear sector within the subregion and the amount that was imported from outside the subregion. Separate production functions for seafood dealers in each subregion were developed from information contained in a Kearney/Centaur report that estimated national economic impacts of commercial fishing, processing, and distribution in the United States (Kearney/Centaur 1986), and from Northeast dealer data on the origin of seafood purchases. Thus, the production functions reflect the actual seafood purchasing activities of dealers from each gear sector within each subregion. The seafood dealer mark-up or margin varied by subregion and was estimated by summing the gear sector coefficients in each seafood dealer production function and subtracting this value from one. In other words, since a production function accounts for all expenditures required to produce one dollar of sales, the sum of all of the non seafood coefficients in the dealer production function measures the additional value seafood dealers must charge to cover their fixed and variable operating costs.

The impacts of the proposed management measures on the flow of seafood from local dealers to processors within each subregion were also examined in the analysis. The IMPLAN system includes a fresh and frozen seafood processing sector in the default data base so it was not necessary to create a new fish processing sector for each subregion.

Impact Assessments

In the I/O model presented here, total economic impacts are calculated by applying estimates of direct revenue changes to IMPLAN generated multipliers that measure the indirect and induced relationships between industries and households in each subregion. Therefore, prior to calculating the total estimated losses (direct + indirect + induced) of each alternative, it was necessary to determine the direct revenue changes associated with the 5 gear sectors, the seafood dealer sector, and the seafood processing sector in each subregion.

Direct revenue losses for the five affected gear sectors in each subregion were estimated by multiplying the total value of all species landed by vessels in these gear sectors that landed groundfish by the proportional loss in total fishing income. The latter was based on aggregating the estimated revenue changes reported earlier to compute expected revenue changes by gear sector and subregion. These direct revenue changes are based on the constant fishing mortality rebuilding strategy.

Direct revenue losses associated with seafood dealers in each subregion were estimated in the following manner. First, the summation of the estimated direct revenue losses associated with the 5 harvesting sectors in each subregion were multiplied by the proportion of total dealer groundfish purchases that were derived from local harvesters (i.e. purchased from harvesters within a particular subregion). This results in an estimate of the value of groundfish harvested in a particular subregion that was purchased by seafood dealers in that same subregion as well as an estimate of seafood purchases by dealers from vessels in other subregions. The proportions used in these calculations were determined from the 1998 Northeast dealer data base and ranged from a low of .17 for New Hampshire Seacoast dealers to a high of .99 for Upper Mid-Coast Maine dealers. Secondly, the results from the first step were multiplied by the dealer mark-ups or margins in each subregion to obtain the estimated direct revenue losses for seafood dealers in each subregion. A description of the steps followed to calculate seafood dealer margins was provided in the previous section.

For purposes of this analysis, seafood processors in each subregion were also estimated to be directly impacted by the proposed management measures. According to IMPLAN default data it was estimated that about 60% of the total groundfish value sold by seafood dealers within each subregion was exported out of New England, either as domestic or foreign exports, and thus were not available to be purchased by local seafood processors or any other sectors in the model. In addition, it was assumed that only the seafood processing sector would be affected by a reduction in seafood dealer sales. Several other sectors purchase groundfish from seafood dealers as an input into their production process, such as eating and drinking establishments, hospitals, hotels and lodging, and amusement and recreation services, but it was assumed that these forward-linked establishments have the ability to purchase substitutes or replace local supply with imports to minimize or eliminate associated losses. According to the data contained within IMPLAN seafood processors purchase approximately 50% of the dealer sales that remain in New England (the remainder is purchased by the aforementioned businesses). As such, the estimated direct revenue losses for the seafood dealer sectors were first multiplied by 0.6 (to eliminate exports) and then by 0.5 to obtain the value of groundfish purchased by seafood processors. These values were then multiplied by the appropriate seafood processing margins to obtain the estimated direct revenue losses for seafood processors in each subregion. Seafood processing margins were calculated by subtracting the seafood dealer coefficient in the processing production function from one. This margin measures the additional value seafood processors charge to cover their fixed and variable operating costs (including profits and taxes).

After the direct revenue losses were estimated for the 5 gear sectors, the seafood dealer sectors, and the seafood processing sectors within each subregion, total economic losses were calculated by applying the revenue losses to the appropriate IMPLAN generated multipliers. Considerable effort was employed to ensure that the impacts were not double counted. The losses associated with seafood dealers exclude the losses associated with the 5 commercial harvesting gear sectors, and the losses associated with seafood processors exclude those attributable to the seafood dealers and the commercial harvesters. Thus, the losses associated with reductions in supply to these sectors can be summed to obtain the total effect on sales, income, and employment within each subregion and to the New England region as a whole.

No attempt was made to estimate forward linked impacts beyond the processing sector because reductions in groundfish supply at the harvesting level are not likely to significantly alter the cost of groundfish for restaurants, hospitals, and supermarkets pay in each subregion. In fact, according to data contained within IMPLAN, less than 2% of the processed seafood purchased by upstream industries is actually derived from processors within each subregion. According to this data, imports from other areas supply the majority of retail-level purchases from processors. Although retail-level purchases of locally processed groundfish may differ from these statistics, it was assumed that no forward-linked impacts would occur in each subregion beyond the seafood processing sector.
The I/O framework is based on a set of inter-industry and household purchases made over a particular calendar year. The annual time frame means that the impact of seasonal fluctuations in supply is not captured. The fact that the production relationships are assumed fixed means that all goods and services produced in the economy will be bought and sold in the same proportions with or without a change in fisheries management. These two factors mean that adaptations by individual establishments or changes in market relationships are not fully captured.

In general terms, seafood consumers are assumed to be unaffected (in terms of their aggregate consumption of seafood although prices may increase) by changes in groundfish management. That is, consumers will still purchase seafood but the mix of species may change as substitute products are made available: farm-raised salmon or shrimp, for example. However, certain segments of the distribution network from harvest to retail may experience very different impacts as a result of groundfish management.

Although an oversimplification, seafood distribution may be segmented into two markets; one that services specialty restaurants, hotels, and retail seafood markets and one that services large restaurant chains, grocery chains, and large institutions. These two markets compete for the same supply of raw material but operate in different ways.

The specialty seafood market consists of a large number of buyers with each one purchasing relatively small quantities of seafood. These purchases are made on a daily or short term basis where changes in market price due to reduced supplies can be passed on to their clientele. With respect to groundfish, this means that the specialty market (the Fulton fish market in New York and to a lesser extent Philadelphia and Baltimore) will tend to bid away groundfish supplies from New England processors that serve the restaurant and grocery chain market. Because buyers in the specialty market operate on very short term supplies and face a relatively inelastic demand (i.e. quantities demanded in consumer markets are relatively insensitive to price) this market segment may not be appreciably affected by the Amendment 13 management alternatives. Note, however, that the extent to which hard quotas result in derby-style fishing would still be very disruptive as market supplies would be very volatile.

Unlike the specialty market the chain market operates over a longer planning horizon, faces a more elastic demand (i.e. consumer demand is much more price sensitive), has fewer buyers but purchases are made in large quantities, and relies on processors to provide finished products for resale. Chain markets usually plan specific seafood promotions that may be planned one-quarter in advance. This marketing strategy requires predictability in terms of both supply and price. In order to meet these requirements, processors must, in turn, be able to source the raw product in consistent quantities at predictable prices. In a time of fluctuating groundfish supplies, New England processors may be able to commit to provide limited quantities to their clients. In this setting localized spikes in landings may result in depressed ex-vessel price not because processors lack the capacity to handle the supply, but because they have no market to accept their product. In this manner, unpredictability in supply has a cascading effect from processors back to harvesters. Note that while some ability to source alternative supplies of groundfish from international imports may be possible, stocks throughout the North Atlantic are depressed and New England processors would have to outbid European buyers.

The fact that business arrangements at the processor level require a longer term commitment to provide agreed upon supplies at agreed upon prices also means that business relationships are developed over time and the inability to provide consistent supplies of groundfish means that buyers in the chain market will turn to alternative seafood products. These buyers will tend to develop longer term relationships with alternative seafood providers meaning lost market share for New England groundfish will be difficult to recover.

For New England processors the primary impact of Amendment 13 will be in how any given management measure affects variability in supply. This means that alternatives with hard TACs or other measures that causes volatility in landings would have a comparatively larger impact on processors. Note that even alternatives that promise reasonably consistent supplies could have comparatively larger impact on New England processors where total supplies are limited. For example, given that specialty markets will outbid processors for groundfish supplies, if half of the market goes to processors and half goes to specialty markets, a 20% reduction in groundfish supply would be absorbed by New England processors resulting in a 40% reduction to New England processors.

The following provides the economic impacts associated with the proposed management alternatives where evaluation of alternatives was limited to consideration of alternatives (1A, 2 with a backstop TAC, 3, 4, and 4A) that meet the conservation objectives for Amendment 13. Alternative 1B and Alternative 2 without a hard TAC backstop do not meet this criterion. Note that the estimated economic impacts of these alternatives would be lower than anything presented below but only because landings would not be consistent with needed fishing mortality rates.

5.4.6.1 New England Regional Economic Impacts of the Proposed Action

The direct economic impact of the Proposed Action consists of the sum of the reduction in gross sales by vessels ($39.0 million), seafood dealers ($15.4 million), and processors ($22.9 million) for a total direct impact of $77.3 million. Note that to avoid double counting the reduced value in dealer and processor sales is measured in terms of sales net of the cost of purchasing seafood from the next lower market level. This direct impact results in an additional $58.2 million in indirect and induced impacts for a combined total impact of $135.5 million to the New England economy (Table 243). However, compared to the New England economy as a whole this impact represents less than 0.02% of total sales in the combined five coastal New England states.

Across sub-regions, the Boston area (20%) would be the most impacted sub-region even though the local Boston-area represented only 9.3% of total loss in combined direct commercial fishing, dealer, and processor sales impacts. However, the Boston-area is an important center of economic activity that provides a large amount of manufacturing, transportation, wholesale trade, financial services and other business services to other New England sub-regions such that the Boston-area indirect plus induced impacts represented 31.1% of total New England-area indirect plus induced impacts. By contrast, the New Bedford area was estimated to account for 36.2% of total direct impacts but only accounted for less than 3% of indirect plus induced impacts. Thus, the total sales impact in the New Bedford was still second only to Boston (19.2% of total New England impact) but the proportion of total New England impact was much less than the New Bedford sub-region's share of direct impact. This highlights the importance of taking into account the inter-industry linkages both within and across sub-regions. For example, the direct impact on the Connecticut Seacoast sub-region was only 1% of total direct impacts but represented almost 20% of total indirect and induced impacts. Combined, the total impact on the Connecticut Seacoast sub-region represents 9.1% of New England economic impacts. As was the case, for New England as a whole, the economic impact in any one sub-region represents, at most less than 0.1% of total sales. This means that while the impacts would, in fact, be concentrated in a few specific industrial sectors the economic viability of any one of the sub-regions would not be threatened even though a specific locality within a sub-region may be relatively more affected.

The estimated impact on personal income was a loss of $55.4 million (Table 244). In general, the share of impact across sub-regions followed a similar pattern to that of gross sales except that the New Bedford sub-region would have a larger loss in personal income than the Boston area. This difference is due to the fact that compared to other industries the share of gross sales going to make personal income payments is much larger. Since the New Bedford direct sales impact for commercial fishing was larger than the Boston sub-region the direct income impact was also larger that when combined with the direct and induced effects, the total income effect was larger than that of the Boston sub-region.

Region-wide the Proposed Action was estimated to impact about 1,900 jobs (Table 245). Of these jobs, almost 800 would be associated with commercial fishing, almost 400 would be in seafood wholesale trade and about 150 would be in the seafood processing sector. The remaining nearly jobs would be in a variety of economic sectors spread throughout the New England coastal states. Across sub-regions, the New Bedford area would be slightly more affected than the Boston area followed by Lower Mid-Coast Maine, and Gloucester. Other than the non-maritime sub-region employment impacts would represent less than 6% of total region-wide impacts.

Sector	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-3,300	0	-17	-3,390	-2,940	-149	-11,100	-869	0	0	-21,765
Medium Bottom Trawl	0	-411	-3,270	-41	-78	-1,470	-372	-339	-3,000	-872	-156	0	-10,009
Small Bottom Trawl	0	-265	-811	-26	-280	-882	-129	-122	-3	-120	0	0	-2,638
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-6	-405	-25	-767	-648	-175	-1,900	-29	-5	-2	0	-3,962
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-46	0	0	227	-2	-806	-3	0	0	0	-630
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-245	-13	-30	-15	-11	-16	-42	-14	-6	-10	-144	-283	-829
Mining	0	0	0	0	0	-1	-4	0	0	0	-1	-3	-9
Construction	-3	-17	-64	-17	-88	-75	-430	-44	-51	-82	-261	-413	-1,544
Manufacturing	-3	-20	-197	-27	-149	-205	-899	-21	-124	-226	-896	-704	-3,470
Fresh and Frozen Seafood Processing	-953	-1,305	-1,385	-192	-2,376	-6,203	-3,689	-221	-4,701	-1,360	-454	-14	-22,852
Manufactured Ice	0	0	0	0	-1	-12	-125	-9	-107	-57	-7	-72	-391
Cordage and Twine	-4	-1	-3	0	0	0	-1	0	-3	-1	-2	-2	-17
Paperboard Containers and Boxes	0	0	-36	-33	-27	-86	-185	0	-80	-133	-225	-584	-1,389
Transportation, Communications and Public Utilities	-5	-18	-139	-20	-204	-146	-1,310	-59	-109	-280	-879	-898	-4,066
Motor Freight Transport and Warehousing	-9	-12	-107	-11	-99	-66	-427	-16	-61	-112	-228	-533	-1,681
Water Transportation	-49	-248	-387	-25	-120	-406	-1,517	-780	-176	-524	-1,963	-222	-6,419
Trade	-11	-51	-281	-75	-400	-289	-1,731	-165	-231	-401	-1,022	-1,610	-6,269
Seafood Dealers	-1	-61	-3,340	-9	-482	-2,410	-1,600	-1,160	-5,560	-715	-65	0	-15,404
Wholesale Trade	-4	-19	-218	-27	-387	-284	-2,287	-34	-196	-281	-1,168	-1,299	-6,203
Finance, Insurance and Real Estate	-4	-31	-298	-35	-412	-364	-3,435	-122	-157	-480	-1,974	-2,524	-9,835
Services	-15	-83	-527	-99	-686	-644	-5,433	-231	-336	-902	-2,650	-3,311	-14,918
Government	-3	-12	-54	-12	-69	-63	-307	-22	-39	-78	-168	-345	-1,173
Other	0	-2	-3	-1	-2	-4	-18	-1	-1	-3	-17	-15	-66
Total	-1,310	-2,574	-14,901	-692	-6,656	-17,435	-27,058	-6,216	-26,072	-7,510	-12,281	-12,833	-135,539

Table 243 - Total New England Coastal Region Sales Impacts (2001 $'s)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-1,904	0	-10	-1,956	-1,696	-86	-6,404	-501	0	0	-12,556
Medium Bottom Trawl	0	-176	-1,400	-18	-33	-629	-159	-145	-1,284	-373	-67	0	-4,284
Small Bottom Trawl	0	-91	-279	-9	-96	-303	-44	-42	-1	-41	0	0	-906
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-3	-216	-14	-409	-345	-93	-1,012	-15	-2	-1	0	-2,111
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-15	0	0	76	-1	-269	-1	0	0	0	-210
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-35	-4	-6	-4	-3	-5	-14	-5	-2	-3	-51	-86	-218
Mining	0	0	0	0	0	0	-1	0	0	0	0	-1	-2
Construction	-2	-9	-34	-9	-49	-44	-258	-25	-30	-46	-158	-239	-901
Manufacturing	0	-5	-64	-7	-38	-49	-256	-6	-31	-60	-275	-180	-970
Fresh and Frozen Seafood Processing	-107	-205	-186	-27	-490	-1,522	-834	-48	-880	-273	-95	-4	-4,673
Manufactured Ice	0	0	0	0	-1	-6	-62	-5	-53	-28	-3	-36	-193
Cordage and Twine	-1	0	-1	0	0	0	0	0	-1	0	-1	0	-5
Paperboard Containers and Boxes	0	0	-8	-6	-6	-16	-42	0	-18	-27	-55	-134	-312
Transportation, Communications and Public Utilities	-2	-5	-36	-5	-50	-38	-383	-14	-27	-70	-250	-228	-1,107
Motor Freight Transport and Warehousing	-3	-3	-33	-4	-31	-22	-141	-5	-20	-36	-79	-171	-547
Water Transportation	-9	-39	-71	-4	-29	-100	-418	-191	-42	-93	-466	-46	-1,507
Trade	-6	-26	-143	-37	-202	-144	-874	-82	-116	-200	-530	-818	-3,179
Seafood Dealers	-1	-32	-1,747	-5	-252	-1,260	-837	-607	-2,908	-374	-34	0	-8,056
Wholesale Trade	-2	-7	-84	-10	-149	-110	-883	-13	-75	-109	-451	-501	-2,395
Finance, Insurance and Real Estate	-1	-7	-81	-5	-84	-56	-805	-21	-28	-104	-470	-657	-2,319
Services	-7	-42	-281	-48	-358	-354	-3,216	-119	-179	-489	-1,522	-1,822	-8,439
Government	-1	-3	-18	-4	-23	-19	-122	-7	-12	-29	-62	-111	-409
Other	0	-2	-3	-1	-2	-4	-18	-1	-1	-3	-17	-15	-66
Total	-175	-658	-6,607	-214	-2,315	-6,908	-11,158	-2,704	-12,127	-2,863	-4,586	-5,050	-55,367

Table 244 – Proposed Action, Total New England Coastal Region Income Impacts (2001 $'s)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-65	0	0	-67	-58	-3	-220	-17	0	0	-431
Medium Bottom Trawl	0	-8	-65	-1	-2	-29	-7	-7	-59	-17	-3	0	-198
Small Bottom Trawl	0	-5	-16	-1	-6	-17	-3	-2	0	-2	0	0	-52
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-8	-1	-15	-13	-3	-38	-1	0	0	0	-78
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-1	0	0	4	0	-16	0	0	0	0	-12
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-5	-1	-1	-1	-1	-1	-1	-1	0	0	-6	-9	-26
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	-1	0	-1	-1	-5	-1	-1	-1	-3	-6	-20
Manufacturing	0	0	-1	0	-1	-1	-4	0	-1	-1	-4	-4	-19
Fresh and Frozen Seafood Processing	-7	-8	-9	-1	-14	-34	-21	-1	-29	-8	-3	0	-135
Manufactured Ice	0	0	0	0	0	0	-2	0	-1	-1	0	-1	-5
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	0	-1	0	0	-1	-1	-3	-7
Transportation, Communications and Public Utilities	0	0	-1	0	-1	-1	-6	0	0	-1	-3	-4	-18
Motor Freight Transport and Warehousing	0	0	-1	0	-1	-1	-4	0	-1	-1	-2	-5	-15
Water Transportation	0	-1	-2	0	-1	-2	-6	-3	-1	-3	-9	-1	-28
Trade	0	-2	-7	-2	-10	-7	-35	-4	-6	-10	-21	-40	-144
Seafood Dealers	0	-1	-76	0	-16	-77	-120	-26	-61	-11	-2	0	-389
Wholesale Trade	0	0	-2	0	-3	-2	-14	0	-2	-2	-6	-10	-41
Finance, Insurance and Real Estate	0	0	-2	0	-2	-1	-13	-1	-1	-3	-8	-12	-42
Services	0	-2	-10	-2	-11	-10	-71	-4	-6	-15	-35	-53	-219
Government	0	0	0	0	-1	0	-2	0	0	-1	-1	-2	-8
Other	0	0	0	0	0	0	-1	0	0	0	-1	-1	-5
Total	-13	-29	-269	-10	-83	-260	-378	-107	-389	-96	-108	-151	-1,894

Table 245 – Proposed Action, Total New England Coastal Region Employment Impacts

5.4.6.1.1 Potential impacts of DAS reductions on vessel location

Public comments on Amendment 13 identified Maine's proximity to offshore groundfish fishing grounds, and the increased steaming times required to reach those grounds, as an intrinsically linked component of DAS reductions that will disproportionately impact the Maine groundfish industry. The specific problem identified appears to be the perception that Maine vessels will relocate to Massachusetts. This issue has also attracted attention in local media both inside and outside of Maine (see "Task force will help protect both fish, groundfishermen," Portland Press Herald, Sept 4, 2003, among others). While public comments focused on Maine, similar arguments could be made for other states.

The theory is investigated in several ways. Changes in documented homeport and principal port locations are tracked as an attempt to understand the "baseline" level of state-to-state vessel transfer over time. Landings and fishing patterns for Maine-based vessels are quantified in an attempt to determine which vessels and which ports are likely to be impacted. Product caught on Georges Bank and landed in Maine ports is quantified, losses due to differential transit times for affected fishing trips are modeled, and the opportunity costs associated with landing Georges Bank fishing trips in Maine is estimated. An upper bound estimate of potential losses for the Maine economy is provided. Finally, the issue of steaming time for offshore trips is put in perspective by comparing the percentage of time spent steaming on offshore and inshore fishing trips.

The results show that Maine's groundfish fleet has shrunk by roughly 40% since 1995, which is consistent with the reduction in multispecies permit holders region-wide (35%). Groundfish revenues in Maine are up approximately 50% from their late-1990's lows. Total revenues generated by Maine vessels but landed outside of Maine have remained constant at roughly 10% of total groundfish revenues from 1995 through 2002. Of 159 active groundfish vessels in Maine in 2002, only 29 reported making trips in statistical areas that are farther from Maine ports than Massachusetts' ports (areas 514, 521 and 522, principally). Twenty Maine vessels landed trips from these statistical areas in Massachusetts in 2002, and this number has remained nearly constant since 1999. Costs associated with steaming time for trips occurring in these statistical areas were roughly 20% of per-trip groundfish revenues for trips reported in statistical area 514, but only 3% of gross revenue in statistical areas 521 and 522. Analysis of steaming time for inshore and offshore trips shows that vessels fishing inshore may spend a significantly greater percentage of their trip time steaming than do vessels fishing offshore trips. Finally, lobster landings data from these areas highlights one potential source for increased revenues for Maine trawlers, demonstrating that the opportunity costs of fishing in Georges Bank statistical areas may be compensated.

Relevant background information on the groundfish fishery in New England

To properly frame the issues surrounding potential economic impacts associated with vessel transfers out of Maine, it is important to understand the trends in vessel movement between states and the efficacy of potential data fields available for conducting such and investigation.

Choosing an indicator of economic impact: the homeport and principal port data fields

The primary impact being discussed in this investigation is that of product landed. Therefore, the homeport and principal port data fields are investigated to determine their comprehensiveness as indicators of the impacts of landed product in any particular state. The results show that homeport state is not an accurate indicator of a vessel's landings activity. Table 246 indicates that, for example, roughly 55% of groundfish revenue by Maine homeported vessels is landed in Maine. Basing estimations of direct impacts of this nature on the homeport data field will likely miss an important portion of vessels with strong ties to the Maine economy. Instead, the principal port data field (Table 247) reveals a much stronger tie between port state and state of primary landing. While a credible argument can be made that homeport is reflective of the communities (and states) in which vessel owners and crew reside, and therefore spend their incomes, landings more often occur in the principal port state than the homeport state. For this reason, the principal port state data field is used for the remainder of this investigation.

Homeport state *(x)*	1995	1996	1997	1998	1999	2000	2001	2002	eight-year avg.
CT	29%	17%	27%	29%	35%	24%	52%	56%	**34%**
MA	96%	96%	93%	88%	87%	85%	86%	82%	**89%**
ME	52%	45%	47%	51%	52%	61%	67%	70%	**56%**
NC	29%	42%	7%	87%	99%	76%	32%	99%	**59%**
NH	84%	70%	83%	84%	84%	83%	83%	88%	**82%**
NJ	58%	59%	49%	62%	54%	71%	60%	66%	**60%**
NY	95%	97%	89%	86%	93%	98%	98%	99%	**94%**
RI	63%	58%	49%	53%	67%	72%	70%	81%	**64%**
VA	22%	50%	83%	59%	6%	39%	17%	47%	**40%**

Table 246 – Percentage of revenue (groundfish only) generated by vessels ho mported in state *(x)* that is landed in that state (source: vessel trip reports).

Principal port state *(x)*	1995	1996	1997	1998	1999	2000	2001	2002	eight-year avg.
CT	90%	91%	97%	85%	94%	79%	88%	93%	**90%**
MA	96%	97%	96%	89%	88%	86%	86%	82%	**90%**
ME	95%	90%	90%	90%	90%	93%	96%	96%	**93%**
NC	60%	97%	100%	87%	99%	87%	35%	100%	**83%**
NH	87%	72%	83%	85%	77%	84%	86%	90%	**83%**
NJ	86%	82%	83%	75%	79%	91%	94%	98%	**86%**
NY	95%	96%	96%	97%	99%	99%	99%	100%	**98%**
RI	93%	91%	78%	89%	91%	88%	86%	91%	**88%**
VA	17%	20%	21%	50%	87%	39%	71%	47%	**44%**

Table 247 – Percentage of groundfish revenue generated by vessels with a principal port state *(x)* that is landed in that state (source: vessel trip reports).

Changes in homeport and principal port in New England

New England vessels routinely change ports for any number of reasons: vessel sale or ownership change, changes in fishery/target species and improved access to markets or dealers are just some of the many reasons a vessel may change it's documented homeport. Table 248 shows the total change in the number of permits listing each state as their documented principal port (Table 249, which shows the same data for the homeport data field, is included for reference). In these tables, only vessels possessing a valid limited access multispecies permit are counted.

Over the eight-year time series, groundfish vessel retention in Maine was roughly consistent with the overall reduction in fleet size across the New England region. With the results of the groundfish vessel buyback program figured in (Table 250), Maine's groundfish fleet has shrunk by 27% since 1995 (the total fleet has been reduced by 24%).

	1995	1996	1997	1998	1999	2000	2001	2002	% Change 95 - 02	% Change 95 - 02 (excl. vsl buyback)
CT	29	29	31	32	30	29	26	23	-21%	-3%
MA	1,029	831	849	800	796	777	761	680	-34%	-23%
MD	10	9	9	9	8	9	8	6	-40%	-20%
ME	369	307	295	281	285	291	273	217	-41%	-27%
NC	53	26	24	20	22	21	24	26	-51%	-45%
NH	106	78	80	76	87	89	85	80	-25%	-16%
NJ	129	88	83	89	89	103	103	89	-31%	-19%
NY	180	154	151	148	151	144	134	125	-31%	-20%
RI	202	161	159	158	162	164	158	139	-31%	-21%
VA	43	16	15	12	11	12	10	11	-74%	-74%

Table 248 – Limited access multispecies permit holders by principal port state, calendar years (Source: multispecies permit database).

	1995	1996	1997	1998	1999	2000	2001	2002	% Change 95 - 02
CT	14	17	19	20	21	18	17	16	14%
MA	1258	1009	1003	923	917	884	848	746	-41%
MD	5	5	5	5	4	5	7	5	0%
ME	219	181	179	191	199	219	216	178	-19%
NC	36	22	21	19	22	21	23	25	-31%
NH	86	61	68	65	76	78	78	76	-12%
NJ	77	50	52	63	65	79	83	75	-3%
NY	232	193	185	178	174	169	156	143	-38%
RI	116	93	87	104	112	123	126	110	-5%
VA	56	24	23	19	17	18	13	14	-75%

Table 249 – Limited access multispecies permit holders by homeport state, calendar years (source: multispecies permit database).

	Number Vessels
CT	5
FL	1
MA	115
MD	2
ME	53
NC	3
NH	9
NJ	15
NY	19
RI	20

Table 250 – Principal port state locations for vessels/permits purchased in the 1996 and 2002 buyback programs.

As an attempt to gauge where vessels that departed Maine went, and where vessels that changed their principal port to Maine came from, Table 251 and Table 252 track those changes that occurred intra-year (i.e., vessels that ended the year with a different principal port state than they began the year with). This list is not comprehensive, as it does not track vessels that changed principal ports on their annual permit renewal application—only vessels that changed principal port during the year are tracked here. This does, however, provide insight into vessel transfers.

State (*X*)	1995	1996	1997	1998	1999	2000	2001	2002	total
AK	.	.	.	.	.	1	.	.	1
CT	1	.	.	.	.	.	.	.	1
MA	1	1	5	5	6	7	7	3	35
NC	.	.	.	.	.	.	1	.	1
NH	.	.	1	.	1	.	1	.	3
NJ	1	.	1	.	.	.	1	1	4
NY	.	.	.	1	1	1	1	.	4
RI	.	.	.	.	.	1	.	.	1
VA	.	.	1	.	.	.	.	.	1

Table 251 – Number of vessels changing principal port state from Maine to state *X* (source: vessel permit database).

State (*X*)	1995	1996	1997	1998	1999	2000	2001	2002	total
CT	.	.	.	1	.	.	.	.	1
MA	4	1	2	3	7	6	3	2	28
NC	.	.	.	.	1	.	.	.	1
NH	1	.	.	.	.	1	.	.	2
NJ	.	.	.	.	.	1	.	.	1
NY	.	.	.	1	.	.	.	2	3
RI	.	.	1	1	.	.	.	2	4

Table 252 – Number of vessels changing principal port state to Maine from state *X* (source: vessel permit database).

5.4.6.2 Preliminary data regarding the groundfish fishery in Maine

Overall, the number of vessels actively fishing for groundfish has declined across New England by 23% over the eight-year time series (Table 253). During this time, the number of vessels principally-ported and landing in ME has decreased 34%. Pro-rated VTR-reported revenues have increased 58% for New England as a whole, while ME pro-rated VTR-reported revenues have rebounded from a steep decline into the late 1990's and are now showing revenues approximately equal to those in 1995 when adjusted for inflation. Non-Maine vessels landing in Maine are contributing less to the state in terms of revenue now than in the late 1990's.

Rolling closures and the GOM cod trip limits likely contributed to declines in revenue and, possibly, the disproportionate decrease in active groundfish vessels (relative to New England as a whole). The state prohibition on landing lobsters may also disadvantage Maine ports relative to their New Hampshire and Massachusetts counterparts. Average distance to the fishing grounds, discussed in some detail later in this section, may contribute as well, but is likely to be much less significant.

year	Active NEMS limited access permit holders		Active NEMS limited access permit holders listing ME as principal port state		Active NEMS limited access permit holders listing ME principal port and landing in ME		Active NEMS limited access permit holders not listing ME as principal port but landing in ME	
	# vessels	value	# vessels	value	# vessels	value	# vessels	value
1995	1812	$79,352,000	258	$21,217,000	251	$19,880,000	46	$1,108,000
1996	1759	$76,184,000	246	$16,911,000	236	$16,008,000	35	$1,693,000
1997	1533	$76,497,000	213	$15,073,000	207	$14,555,000	27	$1,580,000
1998	1553	$84,240,000	200	$15,313,000	193	$14,409,000	19	$1,690,000
1999	1524	$85,344,000	173	$14,459,000	167	$13,515,000	21	$1,460,000
2000	1535	$98,207,000	184	$19,674,000	177	$18,058,000	28	$1,297,000
2001	1485	$111,514,000	183	$21,257,000	174	$19,132,000	27	$743,000
2002	1396	$113,075,000	171	$21,887,000	163	$19,356,000	21	$792,000

Table 253 – Number of NEMS limited access permit holders actively fishing and revenue generated from landings (source: calendar year, prorated vessel trip reports).

	NJ		NY		CT		RI		MA		NH		
Year	# vsls	# trips	# vsls	# trips	# vsls	# trips	# vsls	# trips	# vsls	# trips	# vsls	# trips	Total Revenue
1995	2	2	16	77	10	171	5	10	2	2	1	3	$1,337,000
1996	2	2	18	48	8	267	2	3	2	5	.	.	$903,000
1997	2	3	22	303	6	115	.	.	.	.	3	5	$518,000
1998	3	3	18	158	4	67	.	.	.	.	3	15	$904,000
1999	.	.	23	63	7	157	.	.	.	.	2	4	$944,000
2000	.	.	22	87	7	179	.	.	2	2	3	29	$1,616,000
2001	.	.	24	115	7	135	.	.	2	21	3	14	$2,124,000
2002	.	.	25	147	7	96	1	1	1	1	1	13	$2,503,000

Table 254 – Number of vessels listing Maine as their principal port state but landing outside of Maine; breakdown by state of landing (source: prorated vessel trip reports; revenue in 2002 dollars).

annual % change	ME		NH		MA		RI		NY	
	pp state	transient	pp state	transient	pp state	transient	pp state	transient	pp state	transient
# vessels	-7%	-13%	3%	-4%	-3%	-13%	-5%	11%	-6%	11%
revenue	3%	9%	11%	-3%	11%	5%	21%	85%	22%	175%

Table 255 – Annual rate of change in number of vessels landing groundfish at least once and total revenue of landings for each state, distinguished between vessels listing the landing state as their principal port state (pp state), and vessels with principal port states that differ from the state they landed the trip in (transient) (source: vessel trip reports and vessel permit database).

Table 254 shows that a number of vessels with their principal port state listed as Maine currently land some groundfish outside of Maine. The total amounts of these landings range from seven to eleven percent of the total groundfish revenue generated by Maine principal-ported vessels. What is significant is that these vessels appear to have established ties with dealers outside of Maine, thereby decreasing (albeit to an unknown degree) one source of potential cost increases associated with landing product outside of a principal port state. Table 255 shows that, while the number of registered vessels landing trips in their principal port state has declined for all states except New Hampshire, overall revenues have increased for all states. Maine, notably, has shown the smallest average rate of annual revenue increase among those states where groundfish are typically landed.

Quantifying the potential impacts of DAS reductions on Maine
This section attempts to quantify the impacts of DAS reductions on Maine, first by determining which trips and which vessels are most likely to be impacted, second by estimating the opportunity costs imposed upon impacted trips, and third by providing an upper-bound estimate for potential overall impacts on the Maine, and New England, economies.

Determining potentially impacted trips
Amendment 13 DAS reductions may range anywhere from 35% to 65% in allocated DAS, bringing the pre-settlement agreement Fleet DAS allocation from 88 DAS down to between 57 and 31. Individual DAS allocations will be reduced similarly. This portion of the analysis utilizes extant 2002 trip-level data and therefore the impacts are not reflective of future DAS reductions. The non-linear relationship between utilized DAS and fleet revenues means that these results should not necessarily be reduced by a corresponding factor to accommodate DAS reductions. Furthermore, because the necessary inputs data has a spatial component it is not possible to factor in anticipated stock-specific F reductions to calculate potential impacts. Actual trip-level data is therefore deemed to be the be the best for these purposes but, due to the significant reductions proposed, the resulting estimates are likely to be high.

To determine who may be affected, and by how much, the following criteria are used to sort trips and create an appropriate data set:

- 2002 landings data

Trips by vessels listing Maine as their principal port state
Trips landing groundfish in Maine
Trips reporting fishing in statistical areas other than 511, 512, 513, and 515

Because the perceived problem is the direct shift of product and revenues from Maine to Massachusetts, trips made by Maine vessels and landed in Maine are the focus. 2002 data is utilized to reflect current regulatory and stock status environments. Trips occurring in areas closer to MA than ME are assumed to be potentially impacted and, consequently, trips reported to have occurred in statistical areas 511, 512, 513 and 515 are eliminated from consideration (leaving the focus on areas 514, 521 and 522).

Figure 215 and Table 256 show landing by statistical area for all Maine vessels—note that these data show the vast majority of Maine groundfish landings coming from statistical areas 512, 513 and 515. This begins to show that the differential impacts of DAS reductions may not affect a large portion of the Maine groundfish fleet. Recent landings from statistical areas 521 and 522 have increased; this increase has been fueled in large part by a dramatic rise in haddock landings (Figure 217), which increased four-fold between 1998 and 2002 as the stock size increased and trip limits were raised.

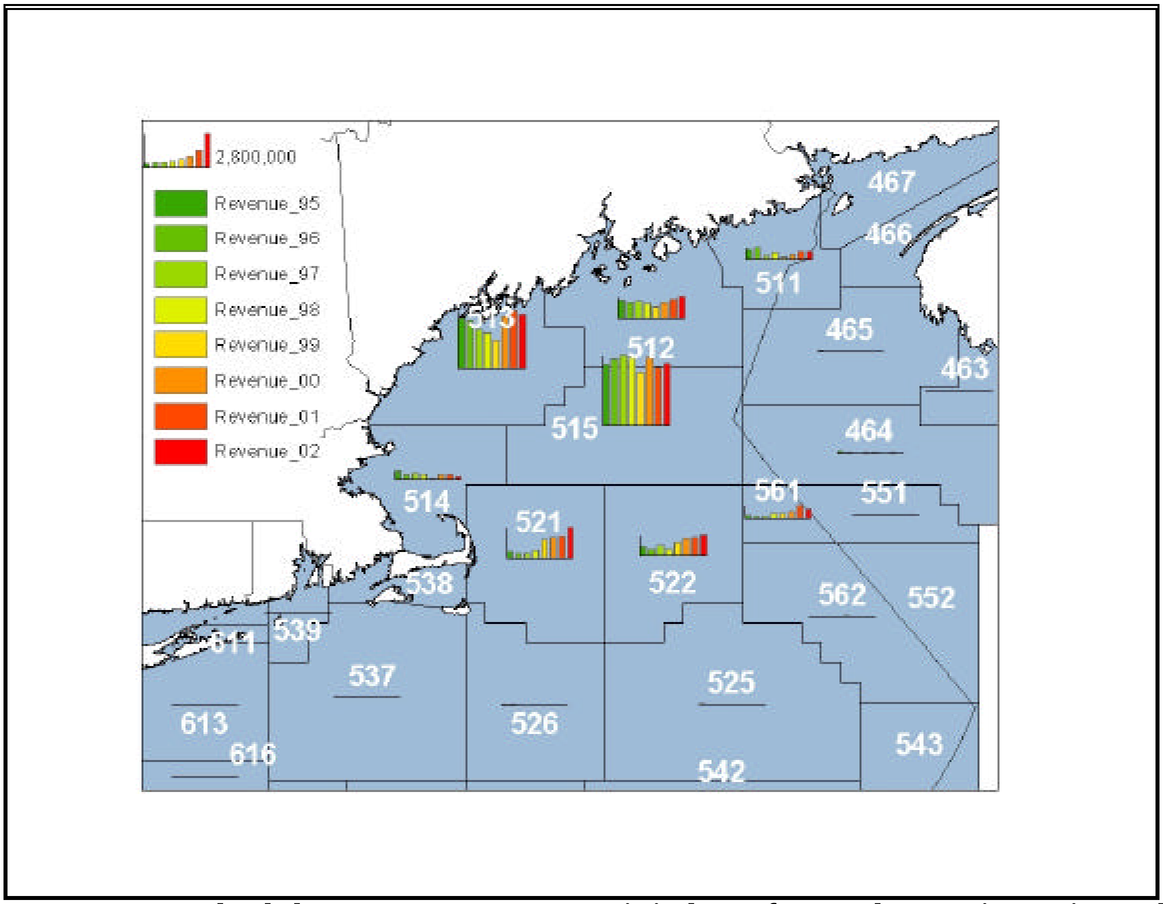


Figure 216 - Average landed revenue per year per statistical area for vessels reporting Maine as their principal port state (source: prorated vessel trip reports, revenues in 2002 dollars).

	1995	1996	1997	1998	1999	2000	2001	2002
511	$1,112,000	$1,096,000	$300,000	$593,000	$234,000	$439,000	$879,000	$862,000
512	$2,438,000	$1,670,000	$1,821,000	$1,745,000	$1,281,000	$1,699,000	$2,005,000	$2,324,000
513	$6,022,000	$4,878,000	$3,840,000	$3,697,000	$2,857,000	$4,952,000	$5,777,000	$5,428,000
514	$880,000	$541,000	$602,000	$490,000	$64,000	$557,000	$513,000	$326,000
515	$7,407,000	$6,663,000	$6,456,000	$6,363,000	$5,370,000	$6,650,000	$6,004,000	$6,315,000
521	$911,000	$559,000	$516,000	$824,000	$2,044,000	$2,138,000	$2,214,000	$3,145,000
522	$1,034,000	$634,000	$884,000	$633,000	$1,310,000	$1,659,000	$1,801,000	$1,987,000
525	$60,000	$43,000		$47,000	$30,000	$2,000	$33,000	$2,000
561	$326,000	$134,000	$94,000	$457,000	$445,000	$729,000	$1,335,000	$926,000
562	$12,000			$4,000	$89,000	$1,000	$22,000	$31,000
SNE	$163,000	$99,000	$12,000	$33,000	$73,000	$36,000	$28,000	$19,000
other	$432,000	$465,000	$491,000	$230,000	$224,000	$223,000	$246,000	$144,000
total	$20,797,000	$16,782,000	$15,016,000	$15,116,000	$14,021,000	$19,085,000	$20,857,000	$21,509,000

Table 256 – Landings revenue by statistical area for vessels listing Maine as their principal port state (source: prorated vessel trip reports).

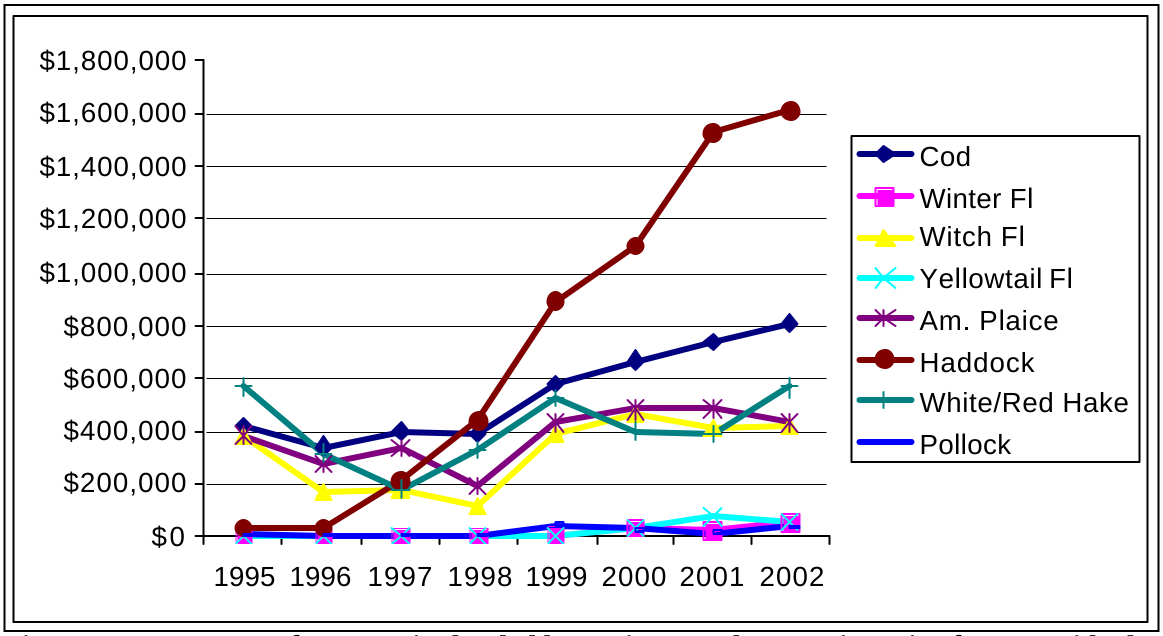


Figure 217 - Revenues from species landed by Maine vessels reporting trips from outside the Gulf of Maine from 1995 through 2002 (source: prorated vessel trip reports, revenues in 2002 dollars).

Table 258 shows that the impacts of Maine vessels fishing on Georges Bank were, in 2002, roughly 22% of the total groundfish revenues for that state. This percentage has increased since the mid-1990's, but has remained relatively constant over the most recent three years Table 258). Thus, it can be estimated that revenues from the fishing trips most likely to be impacted at a differential rate (relative to Massachusetts-based vessels) comprise roughly 20-25% of the total groundfish revenues in Maine. Note that the number of vessels listed in Table 258 refers to all vessels landing at least once in (or out) of Maine; hence, the same Maine vessel may be counted both as landing in and outside of Maine. Table 258 also shows that Maine vessels that do fish on Georges Bank, on average, derive roughly 25-30% of their annual revenue from Georges Bank trips. These data, however, are very noisy (Figure 218) and a handful of vessels earn a significant percentage of their groundfish revenue from the Georges Bank statistical areas.

state	vessels fishing outside stat areas 511, 512, 513 and 515 and landing in Maine					vessels fishing outside stat areas 511, 512, 513 and 515 and landing outside of Maine				
	Maine principal port state vessels		other principal port state vessels			Maine principal port state vessels		other principal port state vessels		
	# vessels	# trips	# vessels	# trips	revenue	# vessels	# trips	# vessels	# trips	revenue (ME vsls only)
1995	41	144	15	43	$2,395,000	16	47	923	13,645	$535,000
1996	32	102	15	37	$1,738,000	10	30	921	13,900	$228,000
1997	35	122	15	28	$1,953,000	7	21	792	12,997	$78,000
1998	28	115	7	24	$2,240,000	11	126	815	12,903	$253,000
1999	41	211	12	51	$4,122,000	20	43	857	12,856	$594,000
2000	35	184	13	47	$4,308,000	19	49	776	11,028	$889,000
2001	33	165	8	17	$4,393,000	21	76	761	12,687	$1,410,000
2002	29	141	2	13	$4,793,000	20	82	701	10,267	$1,733,000

Table 257 - Breakdown of vessels, trips and revenues for fishing trips occurring outside of statistical areas 511, 512, 513, and 515 (source: prorated vessel trip reports).

	Revenues from GB trips	All groundfish revenues	%		% per-vessel annual revenue taken on GB trips	Number vessels	Std. Dev.
1995	$2,395,000	$20,797,000	12%		23%	53	0.23
1996	$1,738,000	$16,782,000	10%		17%	45	0.16
1997	$1,953,000	$15,016,000	13%		27%	42	0.23
1998	$2,240,000	$15,116,000	15%		20%	40	0.22
1999	$4,122,000	$14,021,000	29%		29%	47	0.26
2000	$4,308,000	$19,085,000	23%		31%	47	0.23
2001	$4,393,000	$20,857,000	21%		24%	46	0.19
2002	$4,793,000	$21,509,000	22%		30%	35	0.23

Table 258 – Percentage of total groundfish revenues landed in Maine reported to have come from trips on Georges Bank; and, percent of total annual per-vessel revenue landed from Georges Bank-fished trips for all Maine vessels (source: prorated vessel trip reports).

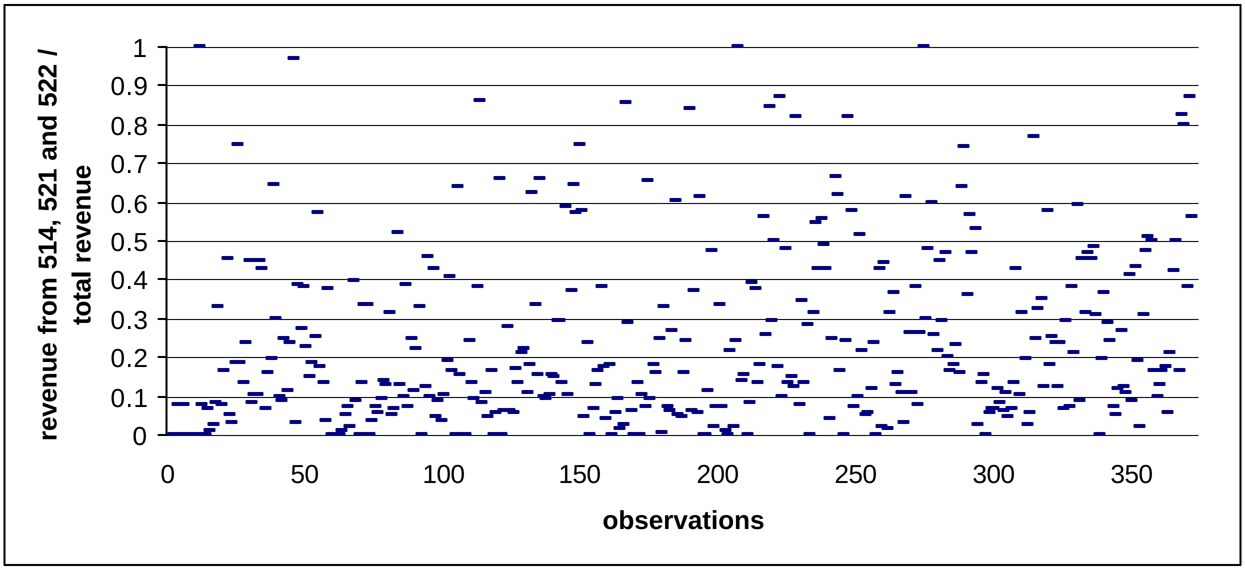


Figure 218 – Scatter plot of George's Bank trips divided by annual revenue for all vessels reporting at least one trip in statistical areas 514, 521 and 522 (source: prorated vessel trip reports).

Quantifying the opportunity costs of additional steaming time

Maine vessels have farther to travel to gain access to Georges Bank than Massachusetts-based vessels. Table 259 shows, for trips landing in various MA and ME ports, the average distance from port, average days absent, per-trip value and per-day value of product landed, and the total number of trips meeting the criteria. It is interesting to note that Maine vessels, on average, produce more revenue per day than their counterparts from other ports for all statistical areas except 522, where they rank second to Gloucester-based vessels. This may be due to the characteristics of the particular vessels (horsepower, gross tonnage, etc), levels of technology present aboard the vessels, or the skill of their captains. In any case, it seems logical that only those vessels able to fish with a high rate of success venture to the Georges Bank fishing grounds.

NEMAREA 514	avg dist (nm)	days absent	value	daily value	# trips
Chatham	44.6	1.24	$1,412	$1,032	194
Gloucester	23.25	1.17	$888	$661	43,652
New Bedford	70.27	4.42	$6,919	$1,867	1,025
Provincetown	31.1	1.2	$1,041	$812	6,266
Portland	119.02	4.55	$10,184	$2,468	316
VMS Demarc (NB trips)	62.38	4.42	$6,919	$1,867	1,025
NEMAREA 515	**avg dist (nm)**	**days absent**	**value**	**daily value**	**# trips**
Gloucester	105.15	4.4	$9,376	$2,079	1,849
New Bedford	142.24	7.88	$12,125	$1,788	80
Provincetown	42.67	1.9	$364	$143	11
Portland	108.38	5.43	$10,991	$2,120	4,010
VMS Demarc (NB trips)	108.4	7.88	$12,125	$1,788	80
NEMAREA 521	**avg dist (nm)**	**days absent**	**value**	**daily value**	**# trips**
Chatham	36.93	1.09	$1,655	$1,503	22,246
Gloucester	76.16	3.61	$10,360	$2,370	2,094
New Bedford	93.08	6.78	$15,504	$2,880	4,634
Provincetown	35.62	1.7	$1,644	$841	1,232
Portland	132.12	6.63	$19,545	$3,251	573
VMS Demarc (NB trips)	51.2	6.78	$15,504	$2,880	4,634
NEMAREA 522	**avg dist (nm)**	**days absent**	**value**	**daily value**	**# trips**
Chatham	83.44	1.06	$1,996	$1,968	756
Gloucester	142.69	5.75	$16,899	$3,000	935
New Bedford	138.67	7.59	$14,904	$2,208	3,969
Provincetown	89.45	5.48	$9,780	$1,717	59
Portland	191.27	7.39	$17,691	$2,504	601
VMS Demarc (NB trips)	92.99	7.59	$14,904	$2,208	3,969

Table 259 – Avg. distance of reported trips from various ports, with avg. days absent, total value, avg. daily value and number of trips reporting lat/long. VMS_demarc info is for reference only and applies to all vessels reporting landing in New Bedford (source: prorated vessel trip reports 1995 - 2002).

In order to assess the estimated value of lost time due to steaming, the distances listed above were used to determine the differential distance between any two ports (in this case, Gloucester and Portland were used). An adjusted revenue per day absent (RPDA) was computed by subtracting transit time, assuming that the point location provided on the vessel trip report was the beginning and end point for the fishing trip and that fishing did not occur between this point and the landing port. Transit speed was estimated to be 9 knots. The adjusted RPDA was used to estimate the potential for revenue gain based on the reduced distance traveled from Gloucester instead of Portland (assuming that the additional catch does not result in a decrease in RPDA). The following flow chart summarizes this process:

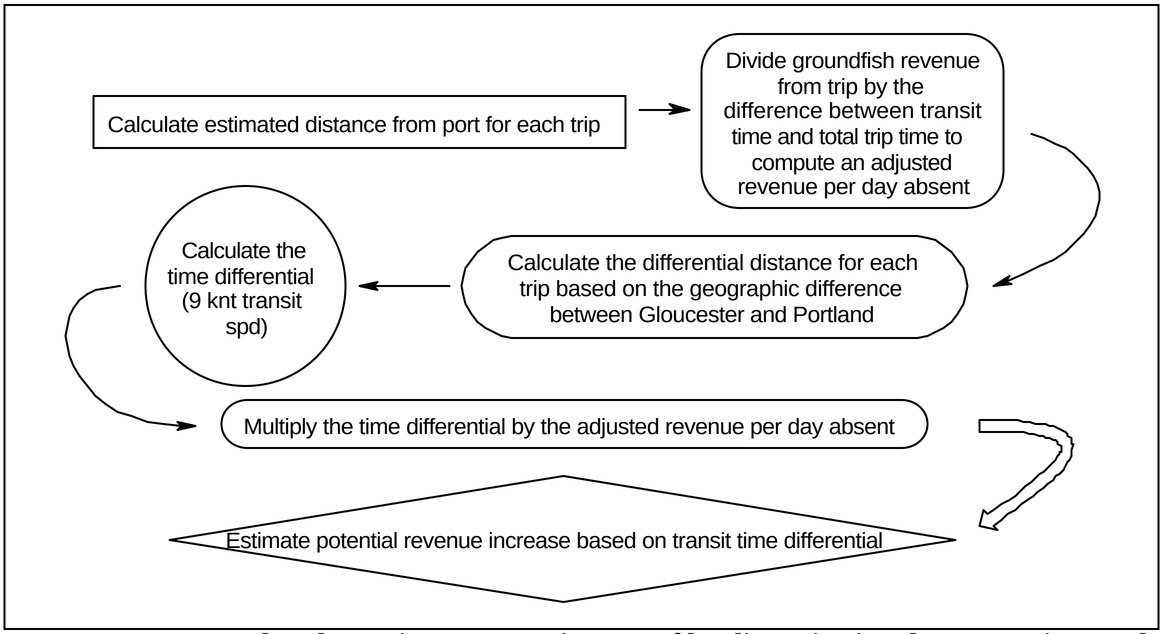


Figure 219 – Process used to determine opportunity cost of landing trips in Gloucester vice Portland.

	Assumed difference in distance to fishing grounds (nm)	Assumed difference - round trip	Assumed add'l hours per trip @ 8 knots transit spd	RPDA	Standard-ized RPDA	# Trips by Portland-based vessels	Potential DAS-based revenue increase through relocation (per trip)	Estimated 2002 potential gross revenue gain (all trips)	Total 2002 gross revenues from areas	Potential percent increase in revenue if trips were made from Gloucester and not Portland
514	95.8	191.54	23.94	$1,989	$2,470	29	$2,191	$63,526	$326,000	**19%**
521	56.0	111.92	13.99	$2,588	$2,808	74	$1,455	$107,648	$3,145,000	**3%**
522	48.6	97.16	12.15	$2,032	$2,165	58	$974	$56,476	$1,987,000	**3%**

Table 260 – Opportunity cost estimates of Maine -based vessels landing Georges Bank trips in Portland vice Gloucester (data based on prorated 2002 vessel trip reports).

Table 260 shows that vessels landing selected trips in Gloucester instead of Portland could expect to increase their revenues by roughly 20% for trips in statistical area 514, and less than five percent for trips in statistical areas 521 and 522. This steaming time opportunity cost likely explains why a relatively few trips are made from Portland in area 514. The roughly five percent opportunity cost for trips in areas 521 and 522 is likely to be compensated by the difference between expected revenues closer to Portland (i.e. statistical areas 513 and 515) and the revenues expected from trips in either 521 and 522 for the trips in these areas. If expected revenues in 513 and 515 were higher at other times during the year, vessels would be expected to continue using Portland as their principal port. If, however, expected revenues on average throughout the year are anticipated to be higher in the Georges Bank statistical areas, Portland-based vessels may be better off (in terms of recouping their opportunity cost) by relocating to Gloucester. A more in-depth, temporally-based investigation would be required to determine when vessels typically make trips to the George's Bank, and what percentage of their overall revenue (vice groundfish revenue, which is used here) is generated from such trips. If vessels have sources of revenue in addition to groundfish, and that revenue is more readily available close to Maine ports, the opportunity cost of landing trips in Maine vice Massachusetts may be significantly more tolerable than if such trips comprised a high percentage of their overall revenue.

Vessel re-location: an upper-bound estimate

It may be possible to quantify, in very rough terms, an upper-bound estimate of the impacts of vessels shifting their fishing operations from Portland to Gloucester. If one is to assume that every trip occurring in statistical areas 514, 521 and 522 in calendar year 2002 will relocate to Gloucester, the direct and indirect impacts of the landed product shift from the Upper and Lower Mid-Coast region of Maine, to the Gloucester region of Massachusetts. In 2002, these vessels landed a total of $4.09 million dollars of groundfish. Using the I/O model, the shift in landed product shows some interesting results (Table 266, Table 267, and Table 268).

The overall adverse impact on the Maine economy is roughly $8 million, while the overall positive impact on the Massachusetts economy is only $7.6 million. The primary reason for this is that the production functions embedded in the model assume that seafood landed in Portland is distributed more locally, while Gloucester has greater economic connectivity outside of Massachusetts and, in fact, outside of the New England region. The overall impact of such a shift on the New England region, consequently, is roughly -$0.3 million. This implies that some economic benefit resulting from the increased landings in Massachusetts are distributed outside of New England.

The model estimates that the overall impact on Maine incomes would be approximately -$3 million based on this upper-bound estimate. However, the overall impact on incomes within the New England region is positive ($142,000) under this scenario (Table 267). This is due to the model's estimates of productivity in the various sectors. Essentially, the model assumes that it takes fewer people to process seafood in Maine than it does in Gloucester and, consequently, more people are employed overall by the shift of product from one region to the other. Similarly, Table 268 shows a positive net impact on 7 jobs for New England as a whole while this hypothetical change would adversely impact 120 jobs in Maine.

Table 261 presents the estimated impacts on Maine (without the consequent impacts on Massachusetts or New England economies noted) in comparison to the contribution of all groundfish fishing, all fishing, and finally all commerce on the Maine economy. These estimates, which likely dramatically over-estimate the impacts as it is unlikely that *all* trips reported in areas 514, 521 and 522 would land their product in Gloucester in order to realize a gain of between five and 20 percent, clearly comprise a very small portion of the fishing economy in Maine. This is not to say that the consequences are insignificant as they are not. If certain business entities have production thresholds below which they cannot remain profitable, the I/O model does not incorporate the impacts of a total shutdown of that entity. With no data to evaluate such situations, however, no further conclusions may be drawn.

	Direct output impacts of vsls relocation	Total output impacts of vsl relocation	Total output impacts of groundfish overall	Total output impacts of all commercial fishing	Total output of local economy (all fishing and non-fishing related impacts)	Vsl relocation output impacts as a percent of all fishing impacts	Vsl relocation output impacts as a percent of all economic impacts
Maine	-$4.03	-$8.00	$63.24	$530.22	$42,949.49	-1.509%	-0.019%

Table 261 – Upper-bound estimates of potential impacts if all vessels fishing at least one trip in statistical areas 514, 521 and 522 relocate to Gloucester from Portland (in millions of dollars).

Steaming time for offshore versus inshore fishing trips

Steaming time is commonly thought to occupy a larger portion of an individual trip's dock-to-dock time for trips farther from shore than for those trips closer to shore. This hypothesis is tested for the Gulf of Maine and northern/central Georges Bank by comparing the percentage of time steamed for trips reporting less than 1.5 days absent and fishing in statistical areas 512, 513, 514 and 521 with trips reporting more than 1.5 days absent and fishing in statistical areas 515, 521, and 522 (see Figure 8 for statistical area locations). This methodology makes the assumption that fishing begins and ends at the point (latitude/longitude coordinates) reported on the vessel trip report. While this is obviously not an accurate assumption, no data exists to indicate if the assumption is individually biased for either group.

A t-test for two independent samples is conducted to test the hypothesis that the mean percent of steaming time is the same for both types of trips. Table 262 and Table 263 show that, for data with both equal and unequal variance, the probability of seeing these two data sets if the mean steaming time percentage were actually the same for the two trip types is less than .0001—or, very unlikely. Essentially, the mean steaming time is dramatically different between the two trip categories, with inshore trips spending a significantly greater percentage of their fishing time steaming than offshore trips.

When these data are viewed on a per-port basis, it is interesting to note that for both inshore and offshore trips, Portland has a lower steaming time percentage than either Gloucester or New Bedford. Chatham and Provincetown have the lowest average steaming times for both categories of trips. Table 265 converts the percentage of steaming time to a mean time per DAS used. For trips taken from a specific port, there is little difference between the amount of time spent steaming for each DAS used. Indeed, the values are remarkably similar with the exception of those for Provincetown (lower in all cases), Chatham (lower for offshore trips), and New Bedford (higher for inshore trips).

Variable	area	N	Lower CL Mean	Mean	Upper CL Mean	Lower CL Std Dev	Std Dev	Upper CL Std Dev
pct_stm	inshore	7184	0.1558	0.1583	0.1608	0.1057	0.1075	0.1092
pct_stm	offshore	1774	0.2119	0.2187	0.2256	0.142	0.1467	0.1517

Table 262 – Descriptive statistics for Inshore and offshore steaming time percentage data.

Variable	Method	Variances	DF	t Value	Pr > |t|
pct_stm	Pooled	Equal	8956	-19.61	<.0001
pct_stm	Satterthwaite	Unequal	2264	-16.31	<.0001

Table 263 – T-test results for Ho=*mean1=mean2*

	Offshore trips				Inshore trips			
	Mean value	Mean distance (nm)	Mean days absent	Mean pct_stm	Mean value	Mean distance (nm)	Mean days absent	Mean pct_stm
Chatham	$7,901	20.29	2.54	0.09	$1,893	18.53	1.07	0.19
Gloucester	$25,552	112.02	5.85	0.25	$2,086	22.86	1.05	0.22
New Bedford	$26,963	114.59	6.55	0.22	$10,678	66.35	1.2	0.59
Provincetown	$15,048	23.49	4	0.1	$2,175	11.53	1.04	0.11
Portland	$25,477	117.15	6.15	0.21	$1,606	28.66	1.04	0.28
Portsmouth	N/A	N/A	N/A	N/A	$772	28.28	1.07	0.27

Table 264 – Inshore and offshore steaming time percentages for various New England groundfish ports (source: prorated vessel trip reports).

	Offshore Trips		Inshore Trips	
	Mean Steaming Time (DAS)	Mean Time/DAS	Mean Steaming Time (DAS)	Mean Steaming Time/DAS
Chatham	0.2286	0.09	0.2033	0.19
Gloucester	1.4625	0.25	0.231	0.22
New Bedford	1.441	0.22	0.708	0.59
Provincetown	0.4	0.1	0.1144	0.11
Portland	1.2915	0.21	0.2912	0.28
Portsmouth	N/A	N/A	0.2889	0.27

Table 265 – Inshore and offshore mean steaming time per DAS used (source: prorated vessel trip reports)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Sea-coast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Fishing: Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-3,080,000	0	0	3,080,000	0	0	0	0	0	0	0
Medium Bottom Trawl	0	-17,000	-860,000	0	0	877,000	0	0	0	0	0	0	0
Small Bottom Trawl	0	0	-56,000	0	0	56,000	0	0	0	0	0	0	0
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-16,000	0	0	16,000	0	0	0	0	0	0	0
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-1,122	-52	-110	-65	-35	-64	-135	-54	-18	-31	-610	-1,158	-3,452
Mining	0	0	0	0	0	-2	-13	0	0	0	-3	-10	-28
Construction	-11	-54	-202	-53	-283	-250	-1,427	-144	-170	-265	-866	-1,358	-5,083
Manufacturing	-6	-42	-259	-54	-316	-437	-1,981	-46	-246	-453	-1,651	-1,534	-7,025
Fresh and Frozen Seafood Processing	0	-1,356	-2,361,123	0	4,679	2,247,243	46	0	4,297	-151	0	0	-106,365
Manufactured Ice	0	0	0	0	-1	-7	-75	-6	-64	-34	-4	-44	-235
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	-1
Paperboard Containers and Boxes	0	0	-166	-155	-125	-398	-859	0	-374	-620	-1,045	-2,714	-6,456
Transportation, Communications and Public Utilities	-11	-40	-328	-49	-508	-360	-3,019	-151	-255	-710	-1,926	-2,274	-9,631
Motor Freight Transport and Warehousing	-37	-49	-447	-48	-413	-274	-1,786	-65	-255	-470	-954	-2,228	-7,026
Water Transportation	-2	-8	-13	-1	-4	-13	-50	-26	-6	-17	-65	-7	-211
Trade	-17	-87	-471	-126	-694	-498	-2,880	-282	-385	-672	-1,682	-2,721	-10,514
Seafood Dealers	0	-916	-1,600,000	0	3,160	1,520,000	31	0	2,900	-102	0	0	-74,927
Wholesale Trade	-10	-46	-538	-67	-956	-701	-5,645	-84	-483	-695	-2,883	-3,206	-15,314
Finance, Insurance and Real Estate	-8	-58	-517	-66	-741	-679	-6,339	-232	-293	-871	-3,591	-4,342	-17,738
Services	-30	-159	-1,027	-199	-1,343	-1,230	-10,077	-444	-662	-1,752	-5,069	-6,455	-28,447
Government	-4	-16	-74	-16	-93	-92	-460	-28	-52	-106	-239	-489	-1,669
Other	0	-3	-5	-1	-4	-7	-34	-3	-2	-6	-32	-29	-126
Total	-1,258	-19,886	-7,977,280	-899	2,323	7,791,230	-34,703	-1,564	3,933	-6,955	-20,619	-28,569	-294,246

Table 266 – Total New England regional sales impacts from shifting selected product landed in Maine to Gloucester; an upper-bound estimate.

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Mar-itime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Fishing: Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-1,776,852	0	0	1,776,852	0	0	0	0	0	0	0
Medium Bottom Trawl	0	-7,276	-368,080	0	0	375,356	0	0	0	0	0	0	0
Small Bottom Trawl	0	0	-19,242	0	0	19,242	0	0	0	0	0	0	0
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-8,523	0	0	8,523	0	0	0	0	0	0	0
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-159	-13	-23	-15	-9	-20	-42	-19	-7	-8	-212	-347	-874
Mining	0	0	0	0	0	-1	-4	0	0	0	-1	-3	-8
Construction	-6	-28	-110	-28	-163	-150	-871	-84	-100	-153	-533	-805	-3,033
Manufacturing	-1	-9	-63	-13	-81	-106	-554	-13	-60	-115	-473	-387	-1,877
Fresh and Frozen Seafood Processing	0	-213	-317,077	0	966	551,633	10	0	805	-30	0	0	236,094
Manufactured Ice	0	0	0	0	0	-3	-37	-3	-32	-17	-2	-21	-116
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	-37	-30	-30	-74	-194	0	-83	-125	-255	-623	-1,451
Transportation, Communications and Public Utilities	-3	-11	-81	-11	-117	-88	-807	-34	-59	-167	-484	-540	-2,402
Motor Freight Transport and Warehousing	-11	-13	-139	-15	-129	-93	-588	-20	-83	-151	-331	-714	-2,287
Water Transportation	0	-1	-2	0	-1	-3	-14	-6	-1	-3	-15	-2	-50
Trade	-8	-42	-231	-59	-341	-241	-1,399	-136	-185	-323	-840	-1,335	-5,139
Seafood Dealers	0	-479	-836,751	0	1,653	794,914	16	0	1,517	-53	0	0	-39,184
Wholesale Trade	-4	-18	-208	-26	-369	-271	-2,181	-32	-186	-268	-1,113	-1,237	-5,912
Finance, Insurance and Real Estate	-2	-13	-132	-8	-140	-98	-1,419	-39	-49	-178	-813	-1,062	-3,953
Services	-14	-77	-535	-95	-685	-660	-5,843	-223	-346	-936	-2,854	-3,477	-15,746
Government	-1	-4	-28	-5	-35	-28	-203	-9	-17	-46	-97	-175	-647
Other	0	-3	-5	-1	-4	-7	-34	-3	-2	-6	-32	-29	-126
Total	-208	-8,201	-3,328,118	-307	514	3,524,676	-14,164	-621	1,110	-2,578	-8,057	-10,756	153,290

Table 267 - Total New England regional income impacts from shifting selected product landed in Maine to Gloucester; an upper-bound estimate.

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-61	0	0	61	0	0	0	0	0	0	0
Medium Bottom Trawl	0	0	-17	0	0	17	0	0	0	0	0	0	0
Small Bottom Trawl	0	0	-1	0	0	1	0	0	0	0	0	0	0
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	0	0	0	0	0	0	0	0	0	0	0
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresh and Frozen Seafood Processing	0	0	-17	0	0	13	0	0	0	0	0	0	-4
Manufactured Ice	0	0	0	0	0	0	0	0	0	0	0	0	0
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	0	0	0	0	0	0	0	0
Transportation, Communiztions and Public Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0
Motor Freight Transport and Warehousing	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0
Trade	0	0	0	0	0	0	0	0	0	0	0	0	0
Seafood Dealers	0	0	-36	0	0	49	0	0	0	0	0	0	13
Wholesale Trade	0	0	0	0	0	0	0	0	0	0	0	0	0
Finanace, Insurance and Real Estate	0	0	0	0	0	0	0	0	0	0	0	0	0
Services	0	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	-133	0	0	141	0	0	0	0	0	0	7

Table 268 – Total New England regional employment impacts from shifting selected product landed in Maine to Gloucester; an upper-bound estimate.

5.4.6.3 New England Regional Economic Impacts of Alternative 1A

The direct economic impact of Alternative 1A consists of the sum of the reduction in gross sales by vessels ($44.1 million), seafood dealers ($17.4 million), and processors ($25.8 million) for a total direct impact of $87.3 million. Note that to avoid double counting the reduced value in dealer and processor sales is measured in terms of sales net of the cost of purchasing seafood from the next lower market level. This direct impact results in an additional $65.9 million in indirect and induced impacts for a combined total impact of $153.2 million to the New England economy (Table 269). However, compared to the New England economy as a whole this impact represents less than 0.03% of total sales in the combined five coastal New England states.

Across subregions, the Boston area (20%) would be the most impacted subregion even though the local Boston-area represented only 11.6% of total loss in combined direct commercial fishing, dealer, and processor sales impacts. However, the Boston-area is an important center of economic activity that provides a large amount of manufacturing, transportation, wholesale trade, financial services and other business services to other New England subregions such that the Boston-area indirect plus induced impacts represented 31.1% of total New England-area indirect plus induced impacts. By contrast, the New Bedford area was estimated to account for 31.3% of total direct impacts but only accounted for less than 3% of indirect plus induced impacts. Thus, the total sales impact in the New Bedford was still second only to Boston (19.1% of total New England impact) but the proportion of total New England impact was much less than the New Bedford subregion's share of direct impact. This highlights the importance of taking into account the inter-industry linkages both within and across subregions. For example, the direct impact on the Connecticut Seacoast subregion was only 1% of total direct impacts but represented almost 20% of total indirect and induced impacts. Combined, the total impact on the Connecticut Seacoast subregion represents 9.1% of New England economic impacts. As was the case, for New England as a whole, the economic impact in any one subregion represents, at most less than 0.2% of total sales. This means that while the impacts would, in fact, be concentrated in a few specific industrial sectors the economic viability of any one of the subregions would not be threatened even though a specific locality within a subregion may be relatively more affected.

The estimated impact on personal income was a loss of $62.4 million (Table 270). In general, the share of impact across subregions followed a similar pattern to that of gross sales except that the New Bedford subregion would have a larger loss in personal income than the Boston area. This difference is due to the fact that compared to other industries the share of gross sales going to make personal income payments is much larger. Since, the New Bedford direct sales impact for commercial fishing was larger than the Boston subregion the direct income impact was also larger that when combined with the direct and induced effects, the total income effect was larger than that of the Boston subregion.

Region-wide Alternative 1A was estimated to impact over 2,100 jobs (Table 271). Of these jobs, almost 900 would be associated with commercial fishing, almost 450 would be in seafood wholesale trade and about 150 would be in the seafood processing sector. The remaining nearly 700 jobs would be in a variety of economic sectors spread throughout the New England coastal states. Across subregions, the New Bedford area would be slightly more affected than the Boston area followed by Lower Mid-Coast Maine, and Gloucester. Other than the non-maritime subregion employment impacts would represent less than 6% of total region-wide impacts.

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-3,780	0	-19	-3,520	-3,310	-159	-12,400	-1,060	0	0	-24,248
Medium Bottom Trawl	0	-510	-3,890	-51	-82	-1,760	-398	-402	-3,360	-1,150	-231	0	-11,833
Small Bottom Trawl	0	-325	-987	-33	-328	-1,170	-154	-138	-6	-178	0	0	-3,319
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-6	-533	-33	-1,050	-904	-250	-1,330	-46	-35	-2	0	-4,188
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-76	0	0	257	-3	-645	-4	0	0	0	-470
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-276	-15	-33	-17	-12	-18	-48	-16	-7	-11	-162	-319	-935
Mining	0	0	0	0	0	-1	-4	0	0	0	-1	-3	-10
Construction	-4	-19	-72	-19	-99	-85	-486	-49	-58	-92	-295	-467	-1,746
Manufacturing	-3	-23	-222	-31	-169	-231	-1,016	-24	-140	-255	-1,013	-796	-3,921
Fresh and Frozen Seafood Processing	-1,074	-1,471	-1,561	-217	-2,678	-6,992	-4,158	-249	-5,299	-1,532	-511	-16	-25,759
Manufactured Ice	0	0	0	0	-2	-14	-143	-11	-122	-66	-8	-83	-448
Cordage and Twine	-4	-1	-3	0	0	0	-1	0	-3	-1	-2	-2	-18
Paperboard Containers and Boxes	0	0	-40	-38	-30	-97	-209	0	-91	-151	-254	-659	-1,569
Transportation, Communications and Public Utilities	-6	-20	-157	-23	-231	-165	-1,482	-67	-123	-316	-995	-1,015	-4,600
Motor Freight Transport and Warehousing	-10	-13	-121	-13	-111	-74	-483	-18	-69	-127	-258	-602	-1,899
Water Transportation	-56	-284	-443	-29	-138	-465	-1,738	-894	-202	-600	-2,249	-254	-7,352
Trade	-12	-58	-318	-85	-453	-327	-1,959	-187	-262	-453	-1,157	-1,822	-7,094
Seafood Dealers	-1	-75	-3,960	-11	-624	-2,770	-1,810	-904	-6,220	-924	-96	0	-17,396
Wholesale Trade	-5	-21	-246	-31	-437	-321	-2,583	-38	-221	-318	-1,320	-1,467	-7,008
Finance, Insurance and Real Estate	-5	-35	-336	-39	-465	-410	-3,876	-138	-177	-541	-2,227	-2,844	-11,094
Services	-17	-94	-596	-112	-775	-728	-6,146	-261	-379	-1,019	-2,996	-3,740	-16,863
Government	-3	-14	-62	-14	-79	-72	-349	-25	-44	-88	-191	-392	-1,332
Other	0	-2	-3	-1	-3	-4	-20	-2	-1	-3	-19	-17	-75
Total	-1,477	-2,985	-17,442	-796	-7,784	-19,871	-30,626	-5,556	-29,232	-8,923	-13,986	-14,500	-153,177
Regional Impact Share	1.0%	1.9%	11.4%	0.5%	5.1%	13.0%	20.0%	3.6%	19.1%	5.8%	9.1%	9.5%	

Table 269 - Alternative 1A Sales Impacts by Region (2001 $'s)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-2,181	0	-11	-2,031	-1,910	-92	-7,154	-612	0	0	-13,989
Medium Bottom Trawl	0	-218	-1,665	-22	-35	-753	-170	-172	-1,438	-492	-99	0	-5,065
Small Bottom Trawl	0	-112	-339	-11	-113	-402	-53	-47	-2	-61	0	0	-1,140
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-3	-284	-18	-559	-482	-133	-708	-24	-19	-1	0	-2,231
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-25	0	0	86	-1	-215	-1	0	0	0	-157
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-40	-4	-7	-4	-3	-6	-16	-6	-3	-3	-57	-96	-246
Mining	0	0	0	0	0	0	-1	0	0	0	0	-1	-3
Construction	-2	-10	-38	-10	-56	-50	-291	-28	-33	-52	-178	-271	-1,019
Manufacturing	-1	-5	-72	-8	-43	-56	-290	-7	-35	-68	-310	-203	-1,097
Fresh and Frozen Seafood Processing	-121	-231	-210	-31	-553	-1,716	-940	-54	-992	-308	-107	-4	-5,267
Manufactured Ice	0	0	0	0	-1	-6	-71	-5	-61	-33	-3	-41	-222
Cordage and Twine	-1	0	-1	0	0	0	0	0	-1	0	-1	0	-6
Paperboard Containers and Boxes	0	0	-9	-7	-7	-18	-47	0	-20	-30	-62	-151	-353
Transportation, Communications and Public Utilities	-2	-6	-41	-5	-57	-43	-433	-16	-30	-79	-283	-257	-1,253
Motor Freight Transport and Warehousing	-3	-4	-37	-4	-35	-25	-159	-5	-22	-41	-90	-193	-618
Water Transportation	-11	-45	-81	-4	-33	-114	-479	-219	-48	-107	-533	-53	-1,727
Trade	-6	-29	-162	-42	-229	-163	-990	-93	-131	-227	-600	-926	-3,599
Seafood Dealers	0	-39	-2,071	-6	-326	-1,449	-947	-473	-3,253	-483	-50	0	-9,097
Wholesale Trade	-2	-8	-95	-12	-169	-124	-998	-15	-85	-123	-509	-566	-2,706
Finance, Insurance and Real Estate	-1	-8	-91	-5	-94	-63	-909	-24	-31	-117	-531	-740	-2,614
Services	-8	-47	-318	-55	-404	-400	-3,639	-135	-202	-553	-1,722	-2,059	-9,542
Governement	-1	-3	-20	-4	-26	-22	-138	-7	-13	-33	-70	-126	-463
Other	0	-2	-3	-1	-3	-4	-20	-2	-1	-3	-19	-17	-75
Total	-198	-774	-7,749	-248	-2,756	-7,842	-12,636	-2,325	-13,583	-3,444	-5,227	-5,706	-62,488
Regional Impact Share	0.3%	1.2%	12.4%	0.4%	4.4%	12.5%	20.2%	3.7%	21.7%	5.5%	8.4%	9.1%	

Table 270 - Alternative 1A Income Impacts by Region (2001 $'s)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-75	0	0	-70	-66	-3	-245	-21	0	0	-480
Medium Bottom Trawl	0	-10	-77	-1	-2	-35	-8	-8	-66	-23	-5	0	-234
Small Bottom Trawl	0	-6	-20	-1	-6	-23	-3	-3	0	-4	0	0	-66
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-11	-1	-21	-18	-5	-26	-1	-1	0	0	-83
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-1	0	0	5	0	-13	0	0	0	0	-9
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-6	-1	-1	-1	-1	-1	-1	-1	0	0	-7	-10	-29
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	-1	0	-1	-1	-6	-1	-1	-1	-4	-6	-23
Manufacturing	0	0	-2	0	-1	-1	-5	0	-1	-2	-5	-5	-21
Fresh and Frozen Seafood Processing	-7	-9	-10	-1	-16	-38	-24	-1	-32	-9	-3	0	-153
Manufactured Ice	0	0	0	0	0	0	-2	0	-1	-1	0	-1	-6
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	0	-1	0	0	-1	-1	-3	-7
Transportation, Communiztions and Public Utilities	0	0	-1	0	-1	-1	-7	0	-1	-1	-4	-5	-20
Motor Freight Transport and Warehousing	0	0	-1	0	-1	-1	-4	0	-1	-1	-2	-6	-17
Water Transportation	0	-2	-2	0	-1	-2	-7	-4	-1	-3	-10	-1	-33
Trade	0	-2	-8	-2	-11	-8	-40	-4	-7	-12	-24	-45	-164
Seafood Dealers	0	-1	-90	0	-20	-89	-136	-21	-68	-14	-3	0	-441
Wholesale Trade	0	0	-2	0	-3	-2	-15	0	-2	-3	-7	-11	-46
Finanace, Insurance and Real Estate	0	0	-2	0	-2	-1	-14	-1	-1	-3	-8	-14	-48
Services	0	-2	-11	-2	-13	-11	-81	-4	-7	-17	-39	-60	-248
Governement	0	0	0	0	-1	0	-2	0	0	-1	-1	-3	-9
Other	0	0	0	0	0	0	-1	0	0	0	-1	-1	-5
Total	-15	-35	-316	-11	-101	-298	-428	-91	-436	-116	-124	-171	-2,141
Regional Impact Share	0.7%	1.6%	14.8%	0.5%	4.7%	13.9%	20.0%	4.2%	20.4%	5.4%	5.8%	8.0%	

Table 271 - Alternative 1A Employment Impacts by Region (# of jobs)

5.4.6.4 New England Regional Economic Impacts of Alternative 1B

Region-wide the estimated impact on sales of all goods and services was estimated to be $95 million (Table 272). These sales impacts were similar for the Boston ($18.9 million) and the New Bedford subregions ($18.4). Estimated sales impacts were also similar on the Gloucester ($12.3 million) and the Lower Mid-Coast Maine subregions ($10.8 million). In all other areas the sales impacts were less than $10 million.

Income impacts in the New England region were estimated to be $39 million (Table 273). Across subregions the income impacts ranged from a low of less than $0.2 million in the Southern Maine (York County) subregion to a high of $8.5 million in the New Bedford subregion. Other than New Bedford the only other subregion with estimated income impacts greater than $5 million was the Boston subregion.

Alternative 1B would affect an estimated 1,300 jobs in the New England coastal state region (Table 274). The employment impacts in the New Bedford and Boston subregions would be similar; between 250 and 275 jobs. The employment impacts on the Lower Mid-Coast and Gloucester subregions were approximately 200 jobs but were less than 100 jobs in all other coastal subregions.

	Downe ast	Upper Mid-Coast	Lower Mid-Coast	Southe rn	NH Seacoast	Gloucest er	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-2,410	0	-11	-2,640	-2,050	-103	-7,800	-722	0	0	-15,736
Medium Bottom Trawl	0	-315	-2,400	-31	-54	-1,010	-244	-241	-2,150	-869	-191	0	-7,505
Small Bottom Trawl	0	-199	-621	-20	-237	-697	-97	-86	-3	-146	0	0	-2,107
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-3	-274	-18	-362	-330	-89	-670	-26	-10	-1	0	-1,783
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-30	0	0	265	-1	-237	-2	0	0	0	-5
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-171	-9	-21	-10	-7	-11	-30	-10	-4	-7	-100	-197	-578
Mining	0	0	0	0	0	0	-3	0	0	0	-1	-2	-6
Construction	-2	-12	-45	-12	-61	-53	-300	-30	-36	-57	-182	-288	-1,079
Manufacturing	-2	-14	-138	-19	-104	-143	-628	-15	-86	-158	-627	-492	-2,426
Fresh and Frozen Seafood Processing	-665	-910	-966	-134	-1,657	-4,326	-2,572	-154	-3,278	-948	-316	-10	-15,937
Manufactured Ice	0	0	0	0	-1	-9	-90	-7	-77	-41	-5	-52	-280
Cordage and Twine	-2	0	-1	0	0	0	-1	0	-1	-1	-1	-1	-8
Paperboard Containers and Boxes	0	0	-25	-23	-19	-60	-129	0	-56	-93	-157	-407	-968
Transportation, Communications and Public Utilities	-4	-12	-97	-14	-142	-102	-915	-41	-76	-195	-613	-627	-2,837
Motor Freight Transport and Warehousing	-6	-8	-75	-8	-69	-46	-298	-11	-42	-78	-159	-371	-1,171
Water Transportation	-35	-178	-278	-18	-86	-292	-1,091	-561	-127	-377	-1,412	-160	-4,618
Trade	-8	-36	-197	-53	-280	-202	-1,213	-116	-162	-281	-716	-1,128	-4,390
Seafood Dealers	0	-46	-2,450	-7	-284	-1,720	-1,110	-441	-3,920	-666	-79	0	-10,724
Wholesale Trade	-3	-13	-152	-19	-269	-198	-1,591	-24	-136	-196	-813	-904	-4,317
Finance, Insurance and Real Estate	-3	-22	-208	-24	-288	-254	-2,399	-85	-109	-335	-1,378	-1,760	-6,866
Services	-10	-58	-368	-69	-479	-450	-3,803	-161	-234	-630	-1,853	-2,310	-10,425
Governement	-2	-9	-38	-9	-49	-45	-217	-15	-27	-55	-119	-244	-828
Other	0	-1	-2	-1	-2	-2	-12	-1	-1	-2	-12	-11	-46
Total	-913	-1,845	-10,796	-489	-4,462	-12,324	-18,883	-3,010	-18,355	-5,866	-8,736	-8,964	-94,642
Regional Impact Share	1.0%	1.9%	11.4%	0.5%	4.7%	13.0%	20.0%	3.2%	19.4%	6.2%	9.2%	9.5%	

Table 272 - Alternative 1B Sales Impacts by Region (2001 $'s)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-1,390	0	-6	-1,523	-1,183	-59	-4,500	-417	0	0	-9,078
Medium Bottom Trawl	0	-135	-1,027	-13	-23	-432	-104	-103	-920	-372	-82	0	-3,212
Small Bottom Trawl	0	-68	-213	-7	-81	-239	-33	-30	-1	-50	0	0	-724
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-1	-146	-10	-193	-176	-48	-357	-14	-5	-1	0	-950
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-10	0	0	88	0	-79	-1	0	0	0	-2
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-24	-3	-4	-2	-2	-4	-10	-4	-2	-2	-36	-60	-152
Mining	0	0	0	0	0	0	-1	0	0	0	0	-1	-2
Construction	-1	-6	-24	-6	-34	-31	-180	-17	-21	-32	-110	-167	-630
Manufacturing	0	-3	-45	-5	-27	-35	-179	-4	-22	-42	-192	-126	-679
Fresh and Frozen Seafood Processing	-75	-143	-130	-19	-342	-1,061	-582	-34	-614	-190	-67	-3	-3,259
Manufactured Ice	0	0	0	0	0	-4	-45	-3	-38	-20	-2	-26	-139
Cordage and Twine	-1	0	0	0	0	0	0	0	-1	0	0	0	-2
Paperboard Containers and Boxes	0	0	-5	-4	-4	-11	-29	0	-12	-19	-38	-93	-217
Transportation, Communications and Public Utilities	-1	-3	-25	-3	-35	-27	-268	-10	-19	-49	-175	-159	-774
Motor Freight Transport and Warehousing	-2	-2	-23	-2	-22	-15	-98	-3	-14	-25	-55	-119	-381
Water Transportation	-7	-28	-51	-3	-21	-72	-301	-138	-30	-67	-335	-33	-1,084
Trade	-4	-18	-100	-26	-142	-101	-613	-58	-81	-140	-371	-573	-2,228
Seafood Dealers	0	-24	-1,281	-4	-149	-900	-580	-231	-2,050	-348	-41	0	-5,608
Wholesale Trade	-1	-5	-59	-7	-104	-76	-615	-9	-52	-76	-314	-349	-1,666
Finance, Insurance and Real Estate	-1	-5	-56	-3	-58	-39	-563	-15	-19	-72	-329	-458	-1,619
Services	-5	-29	-196	-34	-250	-248	-2,253	-83	-125	-342	-1,065	-1,272	-5,903
Governement	0	-2	-12	-3	-16	-13	-86	-5	-8	-20	-43	-78	-288
Other	0	-1	-2	-1	-2	-2	-12	-1	-1	-2	-12	-11	-46
Total	-122	-478	-4,801	-152	-1,511	-4,922	-7,783	-1,242	-8,544	-2,292	-3,269	-3,528	-38,644
Regional Impact Share	0.3%	1.2%	12.4%	0.4%	3.9%	12.7%	20.1%	3.2%	22.1%	5.9%	8.5%	9.1%	

Table 273 - Alternative 1B Income Impacts by Region (2001 $'s)

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-48	0	0	-52	-41	-2	-154	-14	0	0	-311
Medium Bottom Trawl	0	-6	-47	-1	-1	-20	-5	-5	-43	-17	-4	0	-149
Small Bottom Trawl	0	-4	-12	0	-5	-14	-2	-2	0	-3	0	0	-42
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-5	0	-7	-7	-2	-13	-1	0	0	0	-35
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-1	0	0	5	0	-5	0	0	0	0	0
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-4	0	-1	0	0	0	-1	0	0	0	-4	-6	-18
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	-1	0	-1	-1	-4	0	-1	-1	-2	-4	-14
Manufacturing	0	0	-1	0	-1	-1	-3	0	-1	-1	-3	-3	-13
Fresh and Frozen Seafood Processing	-5	-6	-6	-1	-10	-24	-15	-1	-20	-6	-2	0	-94
Manufactured Ice	0	0	0	0	0	0	-1	0	-1	-1	0	-1	-4
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	0	-1	0	0	0	-1	-2	-5
Transportation, Communiztions and Public Utilities	0	0	0	0	-1	0	-4	0	0	-1	-2	-3	-13
Motor Freight Transport and Warehousing	0	0	-1	0	-1	0	-3	0	0	-1	-1	-3	-11
Water Transportation	0	-1	-1	0	0	-1	-4	-2	-1	-2	-6	-1	-20
Trade	0	-1	-5	-1	-7	-5	-25	-3	-4	-7	-15	-28	-101
Seafood Dealers	0	0	-55	0	-9	-55	-83	-10	-43	-10	-2	0	-269
Wholesale Trade	0	0	-1	0	-2	-1	-9	0	-1	-2	-4	-7	-28
Finanace, Insurance and Real Estate	0	0	-1	0	-1	-1	-9	0	-1	-2	-5	-9	-29
Services	0	-1	-7	-1	-8	-7	-50	-3	-4	-10	-24	-37	-153
Government	0	0	0	0	0	0	-1	0	0	0	-1	-2	-5
Other	0	0	0	0	0	0	-1	0	0	0	-1	-1	-3
Total	-9	-21	-196	-7	-54	-185	-263	-47	-275	-78	-78	-106	-1,319
Regional Impact Share	0.7%	1.6%	14.8%	0.5%	4.1%	14.0%	19.9%	3.6%	20.8%	5.9%	5.9%	8.0%	

Table 274 - Alternative 1B Employment Impacts by Region (# of jobs)

5.4.6.5 New England Regional Economic Impacts of Alternative 1C

Region-wide the estimated impact on sales of all goods and services was estimated to be $165 million (Table 275). These sales impacts were similar for the Boston ($33.0 million) and the New Bedford subregions ($31.3). Estimated sales impacts were also similar on the Gloucester ($21.4 million) and the Lower Mid-Coast Maine subregions ($18.2 million). In all other areas the sales impacts were less than $15 million.

Income impacts in the New England region were estimated to be $67.3 million (Table 276). Across subregions the income impacts ranged from a low of less than $0.2 million in the Southern Maine (York, county) and Downeast (Washington, county) subregions to a high of $14.5 million in the New Bedford subregion. Other than New Bedford the only other subregion with estimated income impacts greater than $10 million was the Boston subregion.

Alternative 1C would affect an estimated 2,300 jobs in the New England coastal state region (Table 277). The employment impacts in the New Bedford and Boston subregions would be similar, about 460 jobs. The employment impacts on the Lower Mid-Coast and Gloucester subregions were approximately 320 jobs but were less than 125 jobs in all other coastal subregions.

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-3,970	0	-21	-3,790	-3,560	-175	-13,200	-1,110	0	0	-25,826
Medium Bottom Trawl	0	-510	-4,010	-51	-92	-1,860	-446	-422	-3,600	-1,180	-231	0	-12,402
Small Bottom Trawl	0	-330	-1,000	-33	-345	-1,170	-157	-148	-6	-178	0	0	-3,367
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-8	-539	-34	-1,120	-1,000	-274	-2,100	-46	-36	-2	0	-5,159
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-73	0	0	224	-4	-882	-4	0	0	0	-738
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-299	-16	-36	-18	-13	-20	-52	-18	-7	-12	-175	-345	-1,011
Mining	0	0	0	0	0	-1	-5	0	0	0	-1	-4	-11
Construction	-4	-21	-78	-21	-107	-92	-523	-53	-62	-99	-318	-503	-1,880
Manufacturing	-3	-24	-239	-33	-182	-249	-1,094	-26	-150	-275	-1,090	-857	-4,223
Fresh and Frozen Seafood Processing	-1,162	-1,591	-1,689	-235	-2,897	-7,564	-4,498	-269	-5,732	-1,658	-553	-17	-27,864
Manufactured Ice	0	0	0	0	-2	-15	-153	-11	-130	-70	-8	-88	-477
Cordage and Twine	-5	-1	-4	0	0	0	-1	0	-4	-1	-3	-2	-22
Paperboard Containers and Boxes	0	0	-44	-41	-33	-104	-225	0	-98	-162	-274	-711	-1,692
Transportation, Communications and Public Utilities	-6	-22	-169	-24	-249	-177	-1,597	-72	-132	-341	-1,071	-1,094	-4,955
Motor Freight Transport and Warehousing	-11	-14	-130	-14	-120	-80	-520	-19	-74	-137	-278	-649	-2,047
Water Transportation	-60	-302	-472	-31	-146	-495	-1,849	-951	-215	-639	-2,393	-271	-7,824
Trade	-13	-63	-343	-92	-487	-352	-2,108	-201	-282	-488	-1,245	-1,961	-7,634
Seafood Dealers	-1	-76	-4,090	-11	-664	-2,970	-1,940	-1,290	-6,660	-955	-96	0	-18,754
Wholesale Trade	-5	-23	-266	-33	-472	-346	-2,787	-41	-238	-343	-1,424	-1,583	-7,562
Finance, Insurance and Real Estate	-5	-38	-362	-42	-501	-442	-4,176	-149	-191	-583	-2,399	-3,065	-11,954
Services	-18	-102	-642	-121	-835	-784	-6,614	-281	-409	-1,098	-3,226	-4,030	-18,160
Government	-4	-15	-66	-15	-85	-77	-374	-26	-47	-94	-205	-420	-1,428
Other	0	-2	-3	-1	-3	-4	-22	-2	-1	-4	-21	-19	-81
Total	-1,597	-3,156	-18,225	-849	-8,372	-21,368	-32,979	-7,137	-31,289	-9,464	-15,013	-15,620	-165,070
Regional Impact Share	1.0%	1.9%	11.0%	0.5%	5.1%	12.9%	20.0%	4.3%	19.0%	5.7%	9.1%	9.5%	

Table 275 - Alternative 1c Sales Impacts by Region (2001 $'s)

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-2,290	0	-12	-2,186	-2,054	-101	-7,615	-640	0	0	-14,899
Medium Bottom Trawl	0	-218	-1,716	-22	-39	-796	-191	-181	-1,541	-505	-99	0	-5,308
Small Bottom Trawl	0	-113	-344	-11	-119	-402	-54	-51	-2	-61	0	0	-1,157
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, OQ Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-4	-287	-18	-597	-533	-146	-1,119	-24	-19	-1	0	-2,748
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-24	0	0	75	-1	-294	-1	0	0	0	-246
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-43	-4	-8	-4	-4	-7	-17	-6	-3	-4	-62	-104	-266
Mining	0	0	0	0	0	0	-1	0	0	0	0	-1	-3
Construction	-2	-11	-41	-11	-60	-54	-314	-30	-36	-56	-192	-291	-1,098
Manufacturing	-1	-6	-78	-8	-46	-60	-312	-7	-38	-73	-334	-219	-1,181
Fresh/Frozen Seafood Processing	-131	-250	-227	-33	-598	-1,856	-1,017	-59	-1,073	-333	-116	-5	-5,698
Manufactured Ice	0	0	0	0	-1	-7	-76	-6	-65	-35	-4	-43	-236
Cordage and Twine	-2	0	-1	0	0	0	-1	0	-1	0	-1	-1	-7
Paperboard Containers/ Boxes	0	0	-10	-8	-8	-19	-51	0	-22	-33	-67	-163	-380
Transportation, Communications and Public Utilities	-2	-6	-44	-6	-61	-47	-466	-17	-33	-86	-304	-277	-1,349
Motor Freight Transport /Whse	-3	-4	-40	-4	-38	-27	-171	-6	-24	-44	-96	-208	-666
Water Transportation	-11	-47	-86	-5	-35	-122	-509	-233	-51	-114	-568	-57	-1,837
Trade	-7	-31	-174	-45	-246	-176	-1,065	-100	-141	-244	-645	-997	-3,872
Seafood Dealers	-1	-40	-2,139	-6	-347	-1,553	-1,015	-675	-3,483	-499	-50	0	-9,808
Wholesale Trade	-2	-9	-103	-13	-182	-134	-1,077	-16	-92	-132	-550	-611	-2,919
Finance, Insurance and Real Estate	-1	-9	-98	-5	-102	-68	-979	-26	-34	-126	-571	-798	-2,816
Services	-8	-51	-342	-59	-436	-431	-3,915	-145	-218	-596	-1,853	-2,218	-10,272
Government	-1	-3	-22	-4	-27	-23	-148	-8	-14	-35	-75	-136	-497
Other	0	-2	-3	-1	-3	-4	-22	-2	-1	-4	-21	-19	-81
Total	-214	-809	-8,076	-264	-2,959	-8,430	-13,602	-3,082	-14,512	-3,639	-5,611	-6,146	-67,344
Regional Impact Share	0.3%	1.2%	12.0%	0.4%	4.4%	12.5%	20.2%	4.6%	21.5%	5.4%	8.3%	9.1%	

Table 276 - Alternative 1c Income Impacts by Region (2001 $'s)

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-79	0	0	-75	-70	-3	-261	-22	0	0	-511
Medium Bottom Trawl	0	-10	-79	-1	-2	-37	-9	-8	-71	-23	-5	0	-245
Small Bottom Trawl	0	-7	-20	-1	-7	-23	-3	-3	0	-4	0	0	-67
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, OQ Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-11	-1	-22	-20	-5	-42	-1	-1	0	0	-102
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-1	0	0	4	0	-17	0	0	0	0	-15
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-6	-1	-1	-1	-1	-1	-2	-1	0	0	-7	-11	-32
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	-1	0	-2	-1	-6	-1	-1	-1	-4	-7	-25
Manufacturing	0	0	-2	0	-1	-1	-5	0	-1	-2	-5	-5	-23
Fresh and Frozen Seafood Processing	-8	-10	-11	-2	-17	-42	-26	-2	-35	-10	-3	0	-165
Manufactured Ice	0	0	0	0	0	0	-2	0	-2	-1	0	-1	-6
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	-1	-1	0	0	-1	-1	-3	-8
Transportation, Communications and Public Utilities	0	0	-1	0	-1	-1	-8	0	-1	-1	-4	-5	-22
Motor Freight Transport and Warehousing	0	0	-1	0	-1	-1	-5	0	-1	-1	-2	-6	-19
Water Transportation	0	-2	-2	0	-1	-2	-7	-4	-1	-3	-11	-1	-35
Trade	0	-2	-9	-2	-12	-8	-43	-4	-7	-12	-26	-49	-176
Seafood Dealers	0	-1	-93	0	-21	-95	-145	-29	-73	-15	-3	0	-476
Wholesale Trade	0	0	-2	0	-3	-2	-16	0	-2	-3	-8	-12	-50
Finance, Insurance and Real Estate	0	0	-2	0	-3	-2	-15	-1	-1	-3	-9	-15	-51
Services	0	-2	-12	-2	-14	-12	-87	-5	-7	-18	-42	-65	-267
Government	0	0	0	0	-1	0	-2	0	0	-1	-1	-3	-9
Other	0	0	0	0	0	0	-1	0	0	0	-1	-2	-6
Total	-16	-36	-329	-12	-108	-320	-460	-122	-466	-123	-133	-184	-2,308
Regional Impact Share	0.7%	1.6%	14.3%	0.5%	4.7%	13.9%	19.9%	5.3%	20.2%	5.3%	5.7%	8.0%	

Table 277 - Alternative 1c Employment Impacts by Region

5.4.6.6 New England Regional Economic Impacts of Alternative 1D

Region-wide the estimated impact on sales of all goods and services was estimated to be $110.5 million (Table 278). These sales impacts were similar for the Boston ($22.0 million) and the New Bedford subregions ($21.2). Estimated sales impacts were $14.2 million on the Gloucester subregion while impacts were $11.8 in the Lower Mid-Coast Maine subregion. In all other areas the sales impacts were $10 million or less.

Income impacts in the New England region were estimated to be $45.2 million (Table 279). Across subregions the income impacts ranged from a low of less than $0.1 million in the Southern Maine and Downeast subregions to a high of $9.8 million in the New Bedford subregion. Other than New Bedford the only other subregion with estimated income impacts greater than $5 million were the Boston, Gloucester, and Lower Mid-Coast Maine subregions.

Alternative 1D would affect an estimated 1,500 jobs in the New England coastal state region (Table 280). The employment impacts in the New Bedford and Boston subregions would be similar; between 306 and 316 jobs. The employment impacts on the Lower Mid-Coast and Gloucester subregions were approximately 215 jobs but were less than 100 jobs in all other coastal subregions.

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-2,650	0	-13	-2,970	-2,370	-124	-8,970	-791	0	0	-17,888
Medium Bottom Trawl	0	-315	-2,540	-31	-65	-1,130	-299	-265	-2,470	-904	-191	0	-8,210
Small Bottom Trawl	0	-204	-636	-20	-255	-704	-100	-97	-3	-146	0	0	-2,166
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-5	-280	-19	-452	-469	-115	-1,710	-27	-10	-2	0	-3,089
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-32	0	0	231	-2	-622	-2	0	0	0	-427
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-200	-11	-24	-12	-9	-13	-35	-12	-5	-8	-117	-231	-676
Mining	0	0	0	0	0	-1	-3	0	0	0	-1	-3	-7
Construction	-3	-14	-52	-14	-71	-61	-351	-36	-42	-67	-213	-337	-1,260
Manufacturing	-2	-16	-160	-22	-122	-167	-733	-17	-101	-184	-731	-574	-2,830
Fresh/ Frozen Seafood Processing	-777	-1,064	-1,130	-157	-1,938	-5,061	-3,009	-180	-3,835	-1,109	-370	-12	-18,643
Manufactured Ice	0	0	0	0	-1	-10	-102	-8	-87	-47	-5	-59	-320
Cordage and Twine	-3	0	-2	0	0	0	-1	0	-3	-1	-2	-1	-13
Paperboard Containers and Boxes	0	0	-29	-27	-22	-70	-151	0	-66	-109	-183	-476	-1,133
Transportation, Communications and Public Utilities	-4	-14	-113	-16	-166	-119	-1,068	-48	-89	-228	-716	-732	-3,315
Motor Freight Transport/Whse	-7	-9	-87	-9	-81	-54	-349	-13	-50	-92	-186	-435	-1,371
Water Transportation	-40	-203	-317	-21	-98	-332	-1,241	-638	-144	-429	-1,605	-182	-5,249
Trade	-9	-42	-230	-61	-327	-236	-1,413	-135	-189	-327	-834	-1,314	-5,115
Seafood Dealers	-1	-47	-2,620	-7	-334	-1,970	-1,290	-989	-4,520	-707	-80	0	-12,564
Wholesale Trade	-3	-15	-178	-22	-316	-232	-1,864	-28	-159	-229	-952	-1,059	-5,056
Finance, Insurance and Real Estate	-4	-25	-243	-28	-336	-297	-2,802	-100	-128	-391	-1,610	-2,058	-8,022
Services	-12	-68	-430	-81	-559	-525	-4,431	-188	-274	-736	-2,162	-2,700	-12,166
Government	-2	-10	-44	-10	-57	-52	-251	-18	-32	-63	-137	-282	-958
Other	0	-1	-2	-1	-2	-3	-14	-1	-1	-2	-14	-13	-54
Total	-1,069	-2,065	-11,801	-560	-5,224	-14,242	-21,992	-5,228	-21,194	-6,581	-10,111	-10,467	-110,534
Regional Impact Share	1.0%	1.9%	10.7%	0.5%	4.7%	12.9%	19.9%	4.7%	19.2%	6.0%	9.1%	9.5%	

Table 278 - Alternative 1d Sales Impacts by Region (2001 $'s)

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Glouc-ester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-1,529	0	-8	-1,713	-1,367	-72	-5,175	-456	0	0	-10,320
Medium Bottom Trawl	0	-135	-1,087	-13	-28	-484	-128	-113	-1,057	-387	-82	0	-3,514
Small Bottom Trawl	0	-70	-219	-7	-88	-242	-34	-33	-1	-50	0	0	-744
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, OQ Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-3	-149	-10	-241	-250	-61	-911	-14	-6	-1	0	-1,646
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-11	0	0	77	-1	-207	-1	0	0	0	-142
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-29	-3	-5	-3	-3	-4	-12	-4	-2	-2	-42	-70	-178
Mining	0	0	0	0	0	0	-1	0	0	0	0	-1	-2
Construction	-1	-7	-27	-7	-40	-36	-210	-20	-24	-37	-129	-195	-735
Manufacturing	0	-4	-52	-6	-31	-40	-209	-5	-25	-49	-224	-147	-792
Fresh/Frozen Seafood Processing	-88	-167	-152	-22	-400	-1,242	-681	-39	-718	-223	-78	-3	-3,812
Manufactured Ice	0	0	0	0	0	-5	-51	-4	-44	-23	-2	-29	-158
Cordage and Twine	-1	0	-1	0	0	0	0	0	-1	0	-1	0	-4
Paperboard Containers/Boxes	0	0	-6	-5	-5	-13	-34	0	-15	-22	-45	-109	-255
Transportation/Comm/Util Utilities	-1	-4	-29	-4	-41	-31	-312	-12	-22	-57	-204	-186	-903
Motor Freight Transport /Wshe	-2	-3	-27	-3	-25	-18	-115	-4	-16	-29	-65	-139	-446
Water Transportation	-8	-32	-58	-3	-23	-82	-342	-156	-34	-76	-381	-38	-1,233
Trade	-5	-21	-117	-30	-165	-118	-713	-67	-95	-164	-432	-668	-2,594
Seafood Dealers	0	-25	-1,370	-4	-175	-1,030	-675	-517	-2,364	-370	-42	0	-6,571
Wholesale Trade	-1	-6	-69	-9	-122	-89	-720	-11	-61	-89	-368	-408	-1,952
Finance, Insurance and Real Estate	-1	-6	-66	-4	-68	-45	-657	-17	-23	-85	-384	-536	-1,891
Services	-6	-34	-229	-39	-292	-289	-2,624	-97	-146	-399	-1,242	-1,486	-6,883
Government	-1	-2	-14	-3	-18	-15	-99	-5	-10	-24	-50	-91	-333
Other	0	-1	-2	-1	-2	-3	-14	-1	-1	-2	-14	-13	-54
Total	-143	-522	-5,219	-173	-1,774	-5,673	-9,060	-2,298	-9,847	-2,550	-3,783	-4,119	-45,162
Regional Impact Share	0.3%	1.2%	11.6%	0.4%	3.9%	12.6%	20.1%	5.1%	21.8%	5.6%	8.4%	9.1%	

Table 279 - Alternative 1d Income Impacts by Region (2001 $'s)

Sector	Down-east ME	Upper Mid-Coast ME	Lower Mid-Coast ME	Southern ME	NH Seacoast NH	Gloucester MA	Boston MA	Cape & Islands MA	New Bedford MA	Rhode Island RI	CT Seacoast CT	Non-Maritime NE	New England NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Traw l	0	0	-52	0	0	-59	-47	-2	-178	-16	0	0	-354
Medium Bottom Trawl	0	-6	-50	-1	-1	-22	-6	-5	-49	-18	-4	0	-162
Small Bottom Trawl	0	-4	-13	0	-5	-14	-2	-2	0	-3	0	0	-43
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-6	0	-9	-9	-2	-34	-1	0	0	0	-61
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-1	0	0	5	0	-12	0	0	0	0	-8
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-4	-1	-1	-1	0	-1	-1	0	0	0	-5	-7	-21
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	-1	0	-1	-1	-4	-1	-1	-1	-3	-5	-17
Manufacturing	0	0	-1	0	-1	-1	-4	0	-1	-1	-3	-4	-15
Fresh/ Frozen Seafood Processing	-5	-7	-7	-1	-11	-28	-17	-1	-23	-7	-2	0	-110
Manufactured Ice	0	0	0	0	0	0	-1	0	-1	-1	0	-1	-4
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	0	-1	0	0	-1	-1	-2	-5
Transportation, Communications and Public Utilities	0	0	-1	0	-1	-1	-5	0	0	-1	-3	-3	-15
Motor Freight Transport and Warehousing	0	0	-1	0	-1	0	-3	0	0	-1	-2	-4	-12
Water Transportation	0	-1	-2	0	0	-1	-5	-3	-1	-2	-7	-1	-23
Trade	0	-1	-6	-2	-8	-6	-29	-3	-5	-8	-18	-33	-118
Seafood Dealers	0	-1	-59	0	-11	-63	-97	-23	-50	-11	-2	0	-316
Wholesale Trade	0	0	-2	0	-2	-2	-11	0	-1	-2	-5	-8	-33
Finance, Insurance and Real Estate	0	0	-2	0	-2	-1	-10	0	-1	-2	-6	-10	-34
Services	0	-1	-8	-2	-9	-8	-58	-3	-5	-12	-28	-43	-179
Government	0	0	0	0	0	0	-2	0	0	0	-1	-2	-6
Other	0	0	0	0	0	0	-1	0	0	0	-1	-1	-4
Total	-11	-23	-212	-8	-63	-213	-306	-91	-316	-87	-90	-123	-1,543
Regional Impact Share	0.7%	1.5%	13.7%	0.5%	4.1%	13.8%	19.8%	5.9%	20.5%	5.6%	5.8%	8.0%	

Table 280 - Alternative 1d Employment Impacts by Region

5.4.6.7 New England Regional Economic Impacts of Alternative 2

The estimated region-wide impact on gross sales was $217 million (Table 281). Impact on gross sales was largest in the Boston area ($43 million) followed by the New Bedford subregion ($39 million) and the Gloucester subregion ($31 million). The impact on gross sales would exceed $20 million in the subregions of Lower Mid-Coast Maine and in Non-Maritime New England while sales impacts would be between $10 and $20 million in the New Hampshire Seacoast, Cape and Islands, Rhode Island and Connecticut subregions. Note that economic impacts on Downeast Maine would be about $2 million even though there were no estimated direct impacts associated with commercial fishing. However, the Downeast Maine subregion is still linked to the general New England economy through a variety of economic sectors, principally seafood processing and agriculture.

The value of gross sales includes both the cost of producing goods and services and payments that are made in the form of employee compensation and business profits. Given that costs that are not borne represent cost savings or reduced resource use that would still be available for future use, it is the loss of personal income that represents the larger impact on a region's economic health. Aggregate losses in personal income were estimated to be $88 million for Alternative 2 (Table 282). Of these losses about 20% would occur in both the Boston and New Bedford areas. Note that this does not mean that these losses would be strictly to either city since many ports are included in each subregion and the indirect and induced impacts would likely to be broadly distributed throughout the subregions even though the direct impacts on commercial fishing would be more localized.

Alternative 2 would impact approximately 3,000 jobs, of which, at least two-thirds would be in the commercial fishing, dealer, or seafood processing sectors (Table 283). Job impacts would be largest in the Boston area (601 affected jobs) but employment impacts would exceed 400 jobs in the subregions of Lower Mid-Coast Maine, Gloucester, and New Bedford. Employment impacts would be between 150 and 400 jobs in the New Hampshire Seacoast, Cape and Islands, Rhode Island, Connecticut Seacoast, and Non-Maritime subregions.

	Downeast	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-4,890	0	-34	-4,840	-4,420	-238	-16,000	-1,070	0	0	-31,492
Medium Bottom Trawl	0	-633	-4,960	-64	-137	-2,870	-704	-626	-4,250	-1,220	-168	0	-15,632
Small Bottom Trawl	0	-418	-1,280	-48	-677	-2,120	-216	-228	-29	-152	0	0	-5,168
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-19	-534	-46	-1,690	-2,230	-520	-2,880	-35	-51	-5	0	-8,009
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-367	0	0	-123	-11	-1,930	-7	-1	0	0	-2,440
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-394	-21	-47	-24	-17	-26	-68	-23	-9	-16	-230	-454	-1,330
Mining	0	0	0	0	0	-1	-6	0	0	0	-1	-5	-14
Construction	-5	-27	-103	-27	-140	-121	-688	-70	-82	-131	-418	-661	-2,474
Manufacturing	-5	-32	-316	-43	-239	-327	-1,437	-34	-198	-361	-1,433	-1,126	-5,550
Fresh and Frozen Seafood Processing	-1,530	-2,094	-2,224	-309	-3,814	-9,958	-5,921	-355	-7,546	-2,182	-728	-23	-36,684
Manufactured Ice	0	0	0	0	-2	-19	-198	-15	-169	-91	-10	-115	-619
Cordage and Twine	-8	-1	-6	-1	0	0	-2	0	-7	-2	-5	-3	-34
Paperboard Containers and Boxes	0	0	-58	-54	-43	-138	-297	0	-129	-214	-361	-938	-2,230
Transportation, Communications and Public Utilities	-8	-29	-224	-32	-329	-235	-2,114	-95	-176	-451	-1,420	-1,446	-6,560
Motor Freight Transport and Warehousing	-14	-19	-172	-18	-158	-105	-686	-25	-98	-180	-366	-855	-2,697
Water Transportation	-78	-394	-615	-40	-191	-645	-2,410	-1,240	-280	-833	-3,119	-353	-10,197
Trade	-17	-82	-449	-120	-639	-461	-2,765	-264	-369	-640	-1,633	-2,572	-10,011
Seafood Dealers	-3	-96	-5,130	-15	-1,080	-4,740	-2,490	-2,060	-8,100	-953	-73	0	-24,739
Wholesale Trade	-7	-30	-352	-44	-625	-458	-3,689	-55	-315	-454	-1,884	-2,096	-10,008
Finance, Insurance and Real Estate	-7	-49	-476	-55	-657	-580	-5,479	-195	-250	-765	-3,148	-4,022	-15,682
Services	-24	-134	-846	-159	-1,101	-1,033	-8,708	-370	-539	-1,446	-4,249	-5,311	-23,920
Government	-5	-20	-87	-20	-111	-101	-490	-35	-62	-124	-268	-550	-1,871
Other	0	-2	-4	-1	-4	-6	-28	-2	-2	-5	-27	-24	-106
Total	-2,104	-4,100	-23,138	-1,120	-11,688	-31,137	-43,348	-10,739	-38,652	-11,342	-19,546	-20,553	-217,467
Regional Impact Share	1.0%	1.9%	10.6%	0.5%	5.4%	14.3%	19.9%	4.9%	17.8%	5.2%	9.0%	9.5%	

Table 281 - Alternative 2 Sales Impacts by Region (2001 $'s)

Sector	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-2,821	0	-19	-2,792	-2,550	-137	-9,230	-617	0	0	-18,168
Medium Bottom Trawl	0	-271	-2,123	-27	-59	-1,228	-301	-268	-1,819	-522	-72	0	-6,690
Small Bottom Trawl	0	-144	-440	-16	-233	-728	-74	-78	-10	-52	0	0	-1,776
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-10	-284	-24	-900	-1,188	-277	-1,534	-19	-27	-2	0	-4,266
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-122	0	0	-41	-4	-644	-2	0	0	0	-814
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-56	-6	-10	-6	-5	-9	-23	-8	-4	-5	-82	-137	-350
Mining	0	0	0	0	0	0	-2	0	0	0	0	-1	-4
Construction	-3	-14	-54	-14	-79	-71	-413	-40	-47	-73	-253	-384	-1,445
Manufacturing	-1	-7	-103	-11	-61	-79	-409	-10	-49	-96	-440	-288	-1,553
Fresh and Frozen Seafood Processing	-172	-329	-298	-44	-787	-2,443	-1,339	-77	-1,413	-438	-153	-6	-7,501
Manufactured Ice	0	0	0	0	-1	-9	-99	-7	-85	-45	-5	-56	-306
Cordage and Twine	-2	0	-2	0	0	0	-1	0	-2	-1	-2	-1	-11
Paperboard Containers and Boxes	0	0	-13	-10	-10	-26	-67	0	-29	-43	-88	-215	-501
Transportation, Communications and Public Utilities	-3	-8	-58	-8	-81	-62	-616	-23	-43	-113	-402	-366	-1,783
Motor Freight Transport and Warehousing	-4	-5	-53	-6	-50	-36	-226	-8	-32	-58	-127	-274	-878
Water Transportation	-15	-62	-112	-6	-45	-159	-664	-304	-66	-148	-740	-74	-2,395
Trade	-9	-41	-229	-59	-323	-231	-1,396	-131	-185	-320	-846	-1,307	-5,077
Seafood Dealers	-1	-50	-2,683	-8	-565	-2,479	-1,302	-1,077	-4,236	-498	-38	0	-12,938
Wholesale Trade	-2	-12	-136	-17	-241	-177	-1,425	-21	-121	-175	-728	-808	-3,864
Finance, Insurance and Real Estate	-1	-12	-129	-7	-133	-89	-1,284	-34	-44	-165	-750	-1,047	-3,695
Services	-11	-67	-450	-78	-574	-568	-5,153	-191	-287	-784	-2,440	-2,919	-13,521
Government	-1	-4	-28	-6	-36	-30	-195	-10	-19	-46	-98	-178	-652
Other	0	-2	-4	-1	-4	-6	-28	-2	-2	-5	-27	-24	-106
Total	-282	-1,044	-10,152	-348	-4,205	-12,450	-17,849	-4,606	-17,745	-4,233	-7,292	-8,086	-88,294
Regional Impact Share	0.3%	1.2%	11.5%	0.4%	4.8%	14.1%	20.2%	5.2%	20.1%	4.8%	8.3%	9.2%	

Table 282 - Alternative 2 Income Impacts by Region (2001 $'s)

	Down=east	Upper Mid-Coast	Lower Mid-Coast	South-earn	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-97	0	-1	-96	-87	-5	-317	-21	0	0	-623
Medium Bottom Trawl	0	-13	-98	-1	-3	-57	-14	-12	-84	-24	-3	0	-309
Small Bottom Trawl	0	-8	-25	-1	-13	-42	-4	-5	-1	-3	0	0	-102
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-11	-1	-33	-44	-10	-57	-1	-1	0	0	-159
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-7	0	0	-2	0	-38	0	0	0	0	-48
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-8	-1	-2	-1	-1	-1	-2	-1	0	-1	-10	-14	-41
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	-2	0	-2	-2	-8	-1	-1	-2	-5	-9	-33
Manufacturing	0	0	-2	0	-1	-1	-7	0	-2	-2	-6	-7	-30
Fresh and Frozen Seafood Processing	-10	-13	-15	-2	-23	-55	-34	-2	-46	-13	-4	0	-217
Manufactured Ice	0	0	0	0	0	0	-2	0	-2	-1	0	-2	-8
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	-1	-1	0	-1	-1	-2	-4	-11
Transportation, Communization's and Public Utilities	0	0	-1	0	-1	-1	-10	0	-1	-2	-6	-7	-29
Motor Freight Transport and Warehousing	0	0	-2	0	-1	-1	-6	0	-1	-2	-3	-8	-24
Water Transportation	0	-2	-3	0	-1	-3	-9	-5	-1	-4	-14	-2	-45
Trade	-1	-2	-12	-3	-15	-11	-57	-6	-10	-16	-34	-64	-231
Seafood Dealers	0	-1	-116	0	-35	-152	-187	-47	-89	-15	-2	0	-643
Wholesale Trade	0	0	-3	0	-4	-3	-22	-1	-3	-4	-10	-16	-66
Finance, Insurance and Real Estate	0	0	-3	0	-3	-2	-20	-1	-1	-4	-12	-20	-67
Services	-1	-3	-16	-3	-18	-16	-114	-6	-9	-24	-56	-85	-351
Government	0	0	-1	0	-1	-1	-3	0	0	-1	-2	-4	-12
Other	0	0	0	0	0	0	-2	0	0	0	-2	-2	-8
Total	-21	-46	-415	-16	-158	-491	-601	-188	-569	-141	-170	-242	-3,058
Regional Impact Share	0.7%	1.5%	13.6%	0.5%	5.2%	16.1%	19.6%	6.2%	18.6%	4.6%	5.6%	7.9%	

Table 283 - Alternative 2 Employment Impacts by Region (# of jobs)

5.4.6.8 New England Regional Economic Impacts of Alternatives 3/4 and 4A

As noted previously, in its default form, Alternatives 3 was modeled as though it was identical to Alternative 4 even though the realized impacts of Alternative 3 may differ depending on which option is selected to assign species-area TAC. The estimated impacts of Alternatives 4 and 4A were also found to be virtually indistinguishable. Therefore, the estimated economic impacts for Alternative 4 are representative of that of Alternatives 3 and 4A.

Total impact on New England gross sales was estimated to be $203 million (Table 284). Gross sales in the Boston area were estimated to decline by $40 million while sales impacts in New Bedford and Gloucester; the second and third most affected subregions, were $36 and $29 million respectively. Impacts in other subregions would be about $20 million in Lower Mid-Coast Maine, Connecticut Seacoast, and Non-Maritime New England while sales impacts would be $11 million or less in all other subregions.

Aggregate income impacts were estimated to be $82 million (Table 285). Income effects were largest in the Boston subregion although only slightly more so than the New Bedford subregion. Note that the combined income impacts for commercial fishing, dealers and processing in the New Bedford subregion was greater than that of the Boston subregion. This means that much of the income impacts in the New Bedford subregion would be borne by businesses and households most directly involved in fishing and fishing related industries. By comparison, the income effects would be similar in aggregate but would be more broadly distributed across the spectrum of economic sectors based in the Boston subregion.

Alternative 4 would affect an estimated 2,800 jobs (Table 286). As was the case for other alternatives, the employment impacts would be largest in the Boston and New Bedford subregions with employment impacts on the Gloucester and Lower Mid-Coast Maine subregions running between 400 and 500 jobs most of which would be in fishing or fishing related sectors. Employment impacts in the New Hampshire Seacoast, Cape and Islands, and Connecticut Seacoast were approximately 150 jobs while Rhode Island was the only remaining coastal subregion with employment impacts of more then 100 jobs.

Sector	Down-east	Upper Mid-Coast	Lower Mid-Coast	South-ern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-4,660	0	-29	-4,570	-4,120	-221	-14,900	-1,010	0	0	-29,510
Medium Bottom Trawl	0	-629	-4,840	-64	-131	-2,740	-647	-600	-3,970	-1,200	-168	0	-14,989
Small Bottom Trawl	0	-415	-1,260	-47	-661	-2,040	-207	-215	-29	-154	0	0	-5,028
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-18	-524	-41	-1,630	-2,090	-492	-2,130	-33	-50	-4	0	-7,013
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-367	0	0	-108	-9	-1,410	-7	-1	0	0	-1,902
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-367	-20	-44	-22	-16	-24	-63	-22	-9	-15	-215	-423	-1,239
Mining	0	0	0	0	0	-1	-6	0	0	0	-1	-5	-13
Construction	-5	-26	-96	-25	-131	-113	-642	-65	-77	-122	-390	-617	-2,307
Manufacturing	-4	-30	-294	-41	-223	-305	-1,340	-32	-184	-337	-1,337	-1,051	-5,177
Fresh and Frozen Seafood Processing	-1,425	-1,951	-2,072	-288	-3,553	-9,278	-5,517	-330	-7,031	-2,033	-678	-21	-34,178
Manufactured Ice	0	0	0	0	-2	-18	-187	-14	-159	-86	-10	-108	-583
Cordage and Twine	-7	-1	-5	0	0	0	-2	0	-6	-2	-4	-3	-30
Paperboard Containers and Boxes	0	0	-54	-50	-40	-128	-276	0	-120	-200	-336	-874	-2,078
Transportation, Communications and Public Utilities	-8	-27	-209	-30	-307	-219	-1,971	-89	-164	-420	-1,324	-1,347	-6,115
Motor Freight Transport and Warehousing	-13	-17	-160	-17	-148	-98	-639	-23	-91	-168	-341	-797	-2,513
Water Transportation	-74	-370	-579	-38	-180	-607	-2,268	-1,167	-263	-784	-2,935	-332	-9,597
Trade	-16	-77	-419	-112	-596	-431	-2,581	-246	-345	-597	-1,524	-2,400	-9,345
Seafood Dealers	-2	-95	-4,980	-15	-1,040	-4,480	-2,320	-1,570	-7,550	-922	-72	0	-23,047
Wholesale Trade	-6	-28	-328	-41	-582	-427	-3,437	-51	-294	-423	-1,755	-1,952	-9,323
Finance, Insurance and Real Estate	-6	-46	-443	-51	-612	-541	-5,107	-182	-233	-713	-2,934	-3,746	-14,615
Services	-22	-125	-788	-148	-1,027	-963	-8,124	-345	-502	-1,348	-3,963	-4,950	-22,306
Government	-4	-18	-81	-18	-104	-94	-459	-32	-58	-116	-251	-515	-1,750
Other	0	-2	-4	-1	-4	-5	-26	-2	-2	-5	-25	-23	-99
Total	-1,960	-3,895	-22,207	-1,050	-11,015	-29,280	-40,441	-8,747	-36,026	-10,704	-18,268	-19,162	-202,755
Regional Impact Share	1.0%	1.9%	11.0%	0.5%	5.4%	14.4%	19.9%	4.3%	17.8%	5.3%	9.0%	9.5%	

Table 284 - Alternative 3/4 Sales Impacts by Region (2001 $'s)

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-2,688	0	-17	-2,636	-2,377	-127	-8,596	-583	0	0	-17,025
Medium Bottom Trawl	0	-269	-2,072	-27	-56	-1,173	-277	-257	-1,699	-514	-72	0	-6,415
Small Bottom Trawl	0	-143	-433	-16	-227	-701	-71	-74	-10	-53	0	0	-1,728
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-10	-279	-22	-868	-1,113	-262	-1,135	-18	-27	-2	0	-3,736
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-122	0	0	-36	-3	-470	-2	0	0	0	-634
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-52	-5	-10	-5	-5	-8	-21	-8	-3	-4	-76	-128	-326
Mining	0	0	0	0	0	0	-2	0	0	0	0	-1	-4
Construction	-3	-13	-50	-13	-73	-66	-385	-37	-44	-68	-236	-358	-1,347
Manufacturing	-1	-7	-96	-10	-57	-74	-382	-9	-46	-89	-410	-269	-1,449
Fresh and Frozen Seafood Processing	-161	-307	-278	-41	-733	-2,277	-1,248	-72	-1,316	-408	-143	-6	-6,989
Manufactured Ice	0	0	0	0	-1	-8	-93	-7	-80	-42	-4	-53	-288
Cordage and Twine	-2	0	-2	0	0	0	-1	0	-2	-1	-1	-1	-9
Paperboard Containers and Boxes	0	0	-12	-10	-10	-24	-63	0	-27	-40	-82	-200	-467
Transportation, Communications and Public Utilities	-2	-7	-54	-7	-75	-57	-575	-21	-41	-106	-376	-341	-1,663
Motor Freight Transport and Warehousing	-4	-5	-50	-5	-46	-33	-210	-7	-30	-54	-118	-255	-818
Water Transportation	-14	-58	-105	-6	-43	-149	-625	-286	-62	-140	-696	-70	-2,254
Trade	-8	-38	-213	-55	-302	-215	-1,304	-122	-173	-299	-790	-1,220	-4,740
Seafood Dealers	-1	-50	-2,604	-8	-544	-2,343	-1,213	-821	-3,948	-482	-38	0	-12,053
Wholesale Trade	-2	-11	-127	-16	-225	-165	-1,328	-20	-113	-163	-678	-753	-3,599
Finance, Insurance and Real Estate	-1	-11	-120	-7	-124	-83	-1,197	-32	-41	-154	-699	-975	-3,443
Services	-10	-62	-420	-72	-535	-529	-4,809	-178	-268	-731	-2,276	-2,722	-12,613
Government	-1	-4	-26	-5	-34	-28	-182	-10	-18	-43	-92	-166	-610
Other	0	-2	-4	-1	-4	-5	-26	-2	-2	-5	-25	-23	-99
Total	-263	-1,002	-9,765	-327	-3,978	-11,725	-16,653	-3,696	-16,538	-4,006	-6,815	-7,540	-82,307
Regional Impact Share	0.3%	1.2%	11.9%	0.4%	4.8%	14.2%	20.2%	4.5%	20.1%	4.9%	8.3%	9.2%	

Table 285 - Alternative 3/4 Income Impacts by Region (2001 $'s)

Sector	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-92	0	-1	-90	-82	-4	-295	-20	0	0	-584
Medium Bottom Trawl	0	-12	-96	-1	-3	-54	-13	-12	-79	-24	-3	0	-297
Small Bottom Trawl	0	-8	-25	-1	-13	-40	-4	-4	-1	-3	0	0	-99
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-10	-1	-32	-41	-10	-42	-1	-1	0	0	-139
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-7	0	0	-2	0	-28	0	0	0	0	-38
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-8	-1	-2	-1	-1	-1	-2	-1	0	0	-9	-13	-39
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	0	-2	0	-2	-1	-8	-1	-1	-2	-5	-8	-30
Manufacturing	0	0	-2	0	-1	-1	-7	0	-1	-2	-6	-7	-28
Fresh and Frozen Seafood Processing	-10	-12	-14	-2	-21	-51	-31	-2	-43	-12	-4	0	-202
Manufactured Ice	0	0	0	0	0	0	-2	0	-2	-1	0	-1	-7
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	-1	-1	0	-1	-1	-2	-4	-10
Transportation, Communization's and Public Utilities	0	0	-1	0	-1	-1	-9	0	-1	-1	-5	-6	-27
Motor Freight Transport and Warehousing	0	0	-2	0	-1	-1	-6	0	-1	-2	-3	-7	-23
Water Transportation	0	-2	-3	0	-1	-3	-9	-5	-1	-4	-13	-2	-43
Trade	-1	-2	-11	-3	-14	-10	-53	-5	-9	-15	-32	-59	-215
Seafood Dealers	0	-1	-113	0	-34	-144	-174	-36	-83	-14	-2	0	-600
Wholesale Trade	0	0	-3	0	-4	-3	-20	0	-2	-3	-9	-15	-61
Finance, Insurance and Real Estate	0	0	-3	0	-3	-2	-19	-1	-1	-4	-11	-18	-63
Services	0	-3	-15	-3	-17	-15	-106	-6	-9	-22	-52	-79	-327
Government	0	0	-1	0	-1	0	-3	0	0	-1	-2	-3	-11
Other	0	0	0	0	0	0	-2	0	0	0	-1	-2	-7
Total	-20	-45	-400	-15	-150	-464	-560	-149	-530	-134	-159	-226	-2,851
Regional Impact Share	0.7%	1.6%	14.0%	0.5%	5.3%	16.3%	19.7%	5.2%	18.6%	4.7%	5.6%	7.9%	

Table 286 - Alternative 3/4 Employment Impacts by Region (# of jobs)

5.4.6.9 Impact on Coastal New England Sales, Personal Income, and Employment of a 2009 Rebuilding Date

The direct impact of reduced sales on commercial fishing, seafood dealers, and seafood processing was estimated to be $138 million to the coastal region consisting of the five New England coastal states (Table 287). The total impact (including indirect and induced effects) was $242 million. Across coastal subregions about 20% of this total impact would accrue to the Boston subregion while sales losses in New Bedford and Gloucester would represent 16.3% and 14.6% of total New England region sales impacts.

Gross sales represent both the cost of producing goods and service as well as income payments to workers and business profits. At least a portion of a reduction in sales actually represents cost savings since no production costs would be incurred but income payments would also be lost. These forgone income payments represent a more accurate measure of the economic loss to a subregion of a reduction in commercial fishing landings. The total loss in personal income for the New England region was estimated to be $98 million (Table 288). Income losses were almost $20 million in the Boston subregion; $18 million in New Bedford; and more than $14 million in Gloucester. Income losses were more than $12 million in the Lower Mid-Coast subregion but were less than $10 million in all other subregions.

Alternative 4 with TACs set to achieve conservation objectives by 2009 would affect more than 3,400 jobs in the New England region (Table 289). Across subregions, employment impacts would exceed 500 jobs in Lower Mid-Coast Maine, Gloucester, Boston, and New Bedford. Employment impacts in the New Hampshire Seacoast, Cape and Islands, Rhode Island, and Connecticut Seacoast subregions would range from 150 to 215 jobs but would be less than 100 in all other coastal subregions.

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Sales ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-5,740	0	-31	-5,200	-4,830	-237	-15,800	-1,150	0	0	-32,988
Medium Bottom Trawl	0	-779	-6,110	-87	-153	-3,100	-741	-655	-4,140	-1,400	-262	0	-17,427
Small Bottom Trawl	0	-509	-1,560	-49	-743	-2,240	-255	-235	-37	-190	0	0	-5,819
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-25	-1,080	-73	-3,120	-3,230	-742	-2,630	-69	-111	-5	0	-11,084
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-499	0	0	-181	-10	-1,750	-7	-2	0	0	-2,449
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-438	-24	-53	-27	-19	-29	-75	-26	-10	-18	-256	-504	-1,478
Mining	0	0	0	0	0	-1	-7	0	0	0	-1	-5	-15
Construction	-6	-30	-114	-30	-156	-134	-765	-78	-91	-145	-464	-735	-2,748
Manufacturing	-5	-35	-348	-48	-265	-363	-1,595	-38	-219	-401	-1,589	-1,251	-6,158
Fresh and Frozen Seafood Processing	-1,701	-2,329	-2,473	-344	-4,241	-11,073	-6,585	-394	-8,391	-2,427	-810	-26	-40,793
Manufactured Ice	0	0	0	0	-2	-21	-220	-16	-187	-101	-12	-127	-686
Cordage and Twine	-11	-2	-8	-1	0	0	-3	0	-9	-3	-7	-4	-47
Paperboard Containers and Boxes	0	0	-64	-60	-48	-153	-330	0	-144	-238	-402	-1,043	-2,481
Transportation, Communications and Public Utilities	-9	-32	-249	-36	-366	-261	-2,348	-106	-196	-501	-1,577	-1,606	-7,288
Motor Freight Transport and Warehousing	-16	-21	-191	-20	-176	-117	-762	-28	-109	-201	-407	-951	-2,999
Water Transportation	-86	-433	-676	-44	-210	-709	-2,649	-1,363	-308	-915	-3,428	-388	-11,208
Trade	-19	-91	-499	-133	-710	-513	-3,072	-293	-410	-711	-1,814	-2,857	-11,124
Seafood Dealers	-2	-117	-6,390	-18	-1,690	-5,440	-2,710	-1,910	-8,050	-1,090	-111	0	-27,529
Wholesale Trade	-7	-34	-392	-49	-696	-510	-4,108	-61	-351	-506	-2,098	-2,334	-11,145
Finance, Insurance and Real Estate	-8	-55	-526	-61	-728	-643	-6,072	-216	-277	-848	-3,488	-4,448	-17,370
Services	-27	-149	-939	-177	-1,223	-1,147	-9,657	-411	-599	-1,605	-4,715	-5,897	-26,545
Government	-5	-22	-96	-22	-122	-111	-543	-38	-68	-137	-296	-609	-2,070
Other	0	-3	-5	-1	-4	-6	-31	-3	-2	-5	-30	-27	-118
Total	-2,341	-4,687	-28,011	-1,281	-14,703	-35,184	-48,112	-10,487	-39,475	-12,704	-21,772	-22,813	-241,569
Regional Impact Share	1.0%	1.9%	11.6%	0.5%	6.1%	14.6%	19.9%	4.3%	16.3%	5.3%	9.0%	9.4%	

Table 287 - Alternative 4 with 2009 Rebuild TACs Sales Impacts by Region (2001 $'s)

	Down-east	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucester	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Income ($1,000's)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-3,311	0	-18	-3,000	-2,786	-137	-9,115	-663	0	0	-19,031
Medium Bottom Trawl	0	-333	-2,615	-37	-65	-1,327	-317	-280	-1,772	-599	-112	0	-7,459
Small Bottom Trawl	0	-175	-536	-17	-255	-770	-88	-81	-13	-65	0	0	-1,999
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	-13	-575	-39	-1,662	-1,721	-395	-1,401	-37	-59	-2	0	-5,904
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-166	0	0	-60	-3	-584	-2	-1	0	0	-817
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-63	-6	-11	-6	-5	-10	-25	-9	-4	-5	-91	-152	-389
Mining	0	0	0	0	0	0	-2	0	0	0	0	-1	-4
Construction	-3	-15	-60	-15	-87	-79	-459	-44	-53	-82	-281	-426	-1,605
Manufacturing	-1	-8	-113	-12	-67	-88	-454	-11	-55	-106	-487	-319	-1,722
Fresh and Frozen Seafood Processing	-192	-366	-332	-49	-875	-2,717	-1,489	-86	-1,571	-487	-170	-7	-8,341
Manufactured Ice	0	0	0	0	-1	-10	-109	-8	-94	-50	-5	-62	-339
Cordage and Twine	-3	0	-2	0	0	0	-1	0	-3	-1	-2	-1	-15
Paperboard Containers and Boxes	0	0	-14	-11	-11	-29	-75	0	-32	-48	-98	-239	-558
Transportation, Communications and Public Utilities	-3	-9	-65	-9	-90	-68	-684	-25	-48	-126	-446	-406	-1,979
Motor Freight Transport and Warehousing	-5	-6	-59	-6	-55	-40	-251	-8	-35	-64	-141	-305	-976
Water Transportation	-16	-68	-123	-7	-50	-174	-730	-334	-73	-163	-813	-81	-2,632
Trade	-10	-45	-254	-66	-359	-256	-1,552	-146	-206	-356	-940	-1,452	-5,642
Seafood Dealers	-1	-61	-3,342	-10	-884	-2,845	-1,417	-999	-4,210	-570	-58	0	-14,397
Wholesale Trade	-3	-13	-151	-19	-269	-197	-1,587	-23	-135	-195	-810	-900	-4,303
Finance, Insurance and Real Estate	-1	-13	-142	-8	-147	-98	-1,421	-38	-49	-183	-829	-1,156	-4,085
Services	-12	-74	-500	-86	-637	-630	-5,714	-212	-319	-870	-2,706	-3,241	-15,000
Government	-1	-5	-31	-6	-40	-33	-216	-12	-21	-51	-109	-197	-722
Other	0	-3	-5	-1	-4	-6	-31	-3	-2	-5	-30	-27	-118
Total	-314	-1,215	-12,409	-405	-5,583	-14,158	-19,807	-4,441	-17,848	-4,750	-8,133	-8,974	-98,037
Regional Impact Share	0.3%	1.2%	12.7%	0.4%	5.7%	14.4%	20.2%	4.5%	18.2%	4.8%	8.3%	9.2%	

Table 288 - Alternative 4 with 2009 Rebuild TACs Income Impacts by Region (2001 $'s)

	Downea st	Upper Mid-Coast	Lower Mid-Coast	Southern	NH Seacoast	Gloucest er	Boston	Cape & Islands	New Bedford	Rhode Island	CT Seacoast	Non-Maritime	New England
Sector	ME	ME	ME	ME	NH	MA	MA	MA	MA	RI	CT	NE	NE
Commercial Fishing	Employment (jobs)												
Inshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Bottom Trawl	0	0	-114	0	-1	-103	-96	-5	-313	-23	0	0	-653
Medium Bottom Trawl	0	-15	-121	-2	-3	-61	-15	-13	-82	-28	-5	0	-345
Small Bottom Trawl	0	-10	-31	-1	-15	-44	-5	-5	-1	-4	0	0	-115
Large Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0	0	0	0	0	0	0
Sink Gillnet	0	0	-21	-1	-62	-64	-15	-52	-1	-2	0	0	-219
Diving Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottom Longline	0	0	-10	0	0	-4	0	-35	0	0	0	0	-48
Other Mobile Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-9	-1	-2	-1	-1	-1	-2	-1	0	-1	-11	-16	-46
Mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction	0	-1	-2	0	-2	-2	-9	-1	-1	-2	-6	-10	-36
Manufacturing	0	0	-3	0	-2	-2	-8	0	-2	-2	-7	-8	-34
Fresh and Frozen Seafood Processing	-12	-15	-16	-2	-25	-61	-38	-2	-51	-14	-5	0	-242
Manufactured Ice	0	0	0	0	0	0	-3	0	-2	-1	0	-2	-9
Cordage and Twine	0	0	0	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	0	0	0	0	0	-1	-2	0	-1	-1	-2	-5	-12
Transportation, Communization's and Public Utilities	0	0	-1	0	-2	-1	-11	0	-1	-2	-6	-7	-32
Motor Freight Transport and Warehousing	0	0	-2	0	-2	-1	-7	0	-1	-2	-3	-9	-27
Water Transportation	0	-2	-3	0	-1	-3	-10	-6	-1	-5	-15	-2	-50
Trade	-1	-3	-13	-4	-17	-12	-63	-7	-11	-18	-38	-71	-256
Seafood Dealers	0	-1	-145	-1	-55	-174	-203	-44	-88	-17	-3	0	-730
Wholesale Trade	0	0	-4	0	-5	-3	-24	-1	-3	-4	-11	-18	-74
Finance, Insurance and Real Estate	0	0	-3	0	-4	-2	-22	-1	-1	-5	-13	-22	-74
Services	-1	-3	-17	-4	-20	-18	-127	-7	-10	-27	-62	-95	-389
Government	0	0	-1	0	-1	-1	-4	0	0	-1	-2	-4	-13
Other	0	0	0	0	0	-1	-2	0	0	0	-2	-2	-8
Total	-23	-54	-509	-18	-215	-559	-664	-180	-572	-158	-191	-269	-3,414
Regional Impact Share	0.7%	1.6%	14.9%	0.5%	6.3%	16.4%	19.5%	5.3%	16.8%	4.6%	5.6%	7.9%	

Table 289 - Alternative 4 with 2009 Rebuild TACs Employment Impacts by Region (2001 $'s)

5.4.6.10 Comparison of Sales, Income and Employment Impacts Across Alternatives

Among alternatives designed to meet the fishing mortality rates consistent with the constant fishing (Table 290), personal income (Table 291) or employment (Table 292) while Alternative 2 would have largest impact. The Proposed Action was designed to meet a suite of fishing mortality rates consistent with Fmsy for some stocks and phased fishing mortality for other stocks. This mixed approach results in lower sales impacts than either Alternatives1A, 2 or 3/4.

Alternative 1A sales impacts would be $64 million lower than Alternative 2 and $50 million less than Alternative 4. The Proposed Action sales impacts would be even lower by about $18 million. Note that the differential impact on personal income across alternatives is much less than the sales impacts with the Proposed Action having income effects $33 million less than Alternative 2 and $27 million less than Alternative 4. Employment impacts of Proposed Action would be less than two-thirds that of Alternative 2 and about three-quarters as greater as Alternative 4.

Alternative 1B was designed to meet fishing mortality rates for the first year of the Phased rebuilding strategy for all stocks that are higher than that of the constant fishing mortality. For this reason landings and revenues under Alternative 1B would be higher and the estimated reduction in gross sales relative to the Status Quo was lower ($95 million as compared to $135 million under Proposed Action). However, the phased rebuilding strategy would require additional reductions in fishing mortality at least in 2005, 2006 and 2007 which means that landings, hence revenues may decline in each of four consecutive years beginning in 2004. Thus, the estimated impacts presented herein do not capture the full impact of Alternative 1B relative to the Proposed Action, Alternatives 1A, 2, or 3/4.

In general, the economic impact in terms of sales, income and employment may be expected to follow a pattern similar to that of the projected landings streams. These projections suggest that over a relatively short time frame the phased rebuilding strategy would yield higher revenue streams from 2004 to 2008 would be about the same in 2009 but would be lower for at least the next ten year as compared to the constant fishing mortality rate strategy. This means that Alternative 1B might result in comparatively more favorable region-wide impacts on sales, personal income, and employment for about the first five years of the rebuilding period but would have less favorable economic impacts over a much longer period of time.

Sector	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	With Hard TAC Backstop Alternative 2	Alternative 3 With Hard TAC Alternative 4	Proposed
Commercial Fishing	Sales ($1,000's)						
Inshore Lobster Traps	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0
Large Bottom Trawl	-24,248	-15,736	-25,826	-17,888	-31,492	-29,510	-21,765
Medium Bottom Trawl	-11,833	-7,505	-12,402	-8,210	-15,632	-14,989	-10,009
Small Bottom Trawl	-3,319	-2,107	-3,367	-2,166	-5,168	-5,028	-2,638
Large Scallop Dredge	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0
Sink Gillnet	-4,188	-1,783	-5,159	-3,089	-8,009	-7,013	-3,962
Diving Gear	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0
Bottom Longline	-470	-5	-738	-427	-2,440	-1,902	-630
Other Mobile Gear	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0
Agriculture	-935	-578	-1,011	-676	-1,330	-1,239	-829
Mining	-10	-6	-11	-7	-14	-13	-9
Construction	-1,746	-1,079	-1,880	-1,260	-2,474	-2,307	-1,544
Manufacturing	-3,921	-2,426	-4,223	-2,830	-5,550	-5,177	-3,470
Fresh and Frozen Seafood Processing	-25,759	-15,937	-27,864	-18,643	-36,684	-34,178	-22,852
Manufactured Ice	-448	-280	-477	-320	-619	-583	-391
Cordage and Twine	-18	-8	-22	-13	-34	-30	-17
Paperboard Containers and Boxes	-1,569	-968	-1,692	-1,133	-2,230	-2,078	-1,389
Transportation, Communications and Public Utilities	-4,600	-2,837	-4,955	-3,315	-6,560	-6,115	-4,066
Motor Freight Transport and Warehousing	-1,899	-1,171	-2,047	-1,371	-2,697	-2,513	-1,681
Water Transportation	-7,352	-4,618	-7,824	-5,249	-10,197	-9,597	-6,419
Trade	-7,094	-4,390	-7,634	-5,115	-10,011	-9,345	-6,269
Seafood Dealers	-17,396	-10,724	-18,754	-12,564	-24,739	-23,047	-15,404
Wholesale Trade	-7,008	-4,317	-7,562	-5,056	-10,008	-9,323	-6,203
Finance, Insurance and Real Estate	-11,094	-6,866	-11,954	-8,022	-15,682	-14,615	-9,835
Services	-16,863	-10,425	-18,160	-12,166	-23,920	-22,306	-14,918
Government	-1,332	-828	-1,428	-958	-1,871	-1,750	-1,173
Other	-75	-46	-81	-54	-106	-99	-66
Total	-153,177	-94,642	-165,070	-110,534	-217,467	-202,755	-135,539

Table 290 - Comparison of Sales Impacts Across Alternatives (2001 $'s)

					With Hard TAC Backstop	Alternative 3 With Hard TAC	
Sector	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2	Alternative 4	Proposed Action
Commercial Fishing	Income ($1,000's)						
Inshore Lobster Traps	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0
Large Bottom Trawl	-13,989	-9,078	-14,899	-10,320	-18,168	-17,025	-12,556
Medium Bottom Trawl	-5,065	-3,212	-5,308	-3,514	-6,690	-6,415	-4,284
Small Bottom Trawl	-1,140	-724	-1,157	-744	-1,776	-1,728	-906
Large Scallop Dredge	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0
Sink Gillnet	-2,231	-950	-2,748	-1,646	-4,266	-3,736	-2,111
Diving Gear	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0
Bottom Longline	-157	-2	-246	-142	-814	-634	-210
Other Mobile Gear	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0
Agriculture	-246	-152	-266	-178	-350	-326	-218
Mining	-3	-2	-3	-2	-4	-4	-2
Construction	-1,019	-630	-1,098	-735	-1,445	-1,347	-901
Manufacturing	-1,097	-679	-1,181	-792	-1,553	-1,449	-970
Fresh and Frozen Seafood Processing	-5,267	-3,259	-5,698	-3,812	-7,501	-6,989	-4,673
Manufactured Ice	-222	-139	-236	-158	-306	-288	-193
Cordage and Twine	-6	-2	-7	-4	-11	-9	-5
Paperboard Containers and Boxes	-353	-217	-380	-255	-501	-467	-312
Transportation, Communications and Public Utilities	-1,253	-774	-1,349	-903	-1,783	-1,663	-1,107
Motor Freight Transport and Warehousing	-618	-381	-666	-446	-878	-818	-547
Water Transportation	-1,727	-1,084	-1,837	-1,233	-2,395	-2,254	-1,507
Trade	-3,599	-2,228	-3,872	-2,594	-5,077	-4,740	-3,179
Seafood Dealers	-9,097	-5,608	-9,808	-6,571	-12,938	-12,053	-8,056
Wholesale Trade	-2,706	-1,666	-2,919	-1,952	-3,864	-3,599	-2,395
Finance, Insurance and Real Estate	-2,614	-1,619	-2,816	-1,891	-3,695	-3,443	-2,319
Services	-9,542	-5,903	-10,272	-6,883	-13,521	-12,613	-8,439
Government	-463	-288	-497	-333	-652	-610	-409
Other	-75	-46	-81	-54	-106	-99	-66
Total	-62,488	-38,644	-67,344	-45,162	-88,294	-82,307	-55,367

Table 291 - Comparison of Personal Income Impacts Across Alternatives (2001 $'s)

					With Hard TAC Backstop	Alternative 3 With Hard TAC	
Sector	Alternative 1A	Alternative B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 4	Proposed
Commercial Fishing	Employment (jobs) Affected						
Inshore Lobster Traps	0	0	0	0	0	0	0
Offshore Lobster Traps	0	0	0	0	0	0	0
Large Bottom Trawl	-480	-311	-511	-354	-623	-584	-431
Medium Bottom Trawl	-234	-149	-245	-162	-309	-297	-198
Small Bottom Trawl	-66	-42	-67	-43	-102	-99	-52
Large Scallop Dredge	0	0	0	0	0	0	0
Medium Scallop Dredge	0	0	0	0	0	0	0
Small Scallop Dredge	0	0	0	0	0	0	0
Surf Clam, Ocean Quahog Dredge	0	0	0	0	0	0	0
Sink Gillnet	-83	-35	-102	-61	-159	-139	-78
Diving Gear	0	0	0	0	0	0	0
Midwater Trawl	0	0	0	0	0	0	0
Fish Pots and Traps	0	0	0	0	0	0	0
Bottom Longline	-9	0	-15	-8	-48	-38	-12
Other Mobile Gear	0	0	0	0	0	0	0
Other Fixed Gear	0	0	0	0	0	0	0
Hand Gears	0	0	0	0	0	0	0
Agriculture	-29	-18	-32	-21	-41	-39	-26
Mining	0	0	0	0	0	0	0
Construction	-23	-14	-25	-17	-33	-30	-20
Manufacturing	-21	-13	-23	-15	-30	-28	-19
Fresh and Frozen Seafood Processing	-153	-94	-165	-110	-217	-202	-135
Manufactured Ice	-6	-4	-6	-4	-8	-7	-5
Cordage and Twine	0	0	0	0	0	0	0
Paperboard Containers and Boxes	-7	-5	-8	-5	-11	-10	-7
Transportation, Communications and Public Utilities	-20	-13	-22	-15	-29	-27	-18
Motor Freight Transport and Warehousing	-17	-11	-19	-12	-24	-23	-15
Water Transportation	-33	-20	-35	-23	-45	-43	-28
Trade	-164	-101	-176	-118	-231	-215	-144
Seafood Dealers	-441	-269	-476	-316	-643	-600	-389
Wholesale Trade	-46	-28	-50	-33	-66	-61	-41
Finance, Insurance and Real Estate	-48	-29	-51	-34	-67	-63	-42
Services	-248	-153	-267	-179	-351	-327	-219
Government	-9	-5	-9	-6	-12	-11	-8
Other	-5	-3	-6	-4	-8	-7	-5
Total	-2,141	-1,319	-2,308	-1,543	-3,058	-2,851	-1,894

Table 292 - Comparison of Employment Impacts Across Alternatives (2001 $'s)

5.4.7 Economic Impacts of Recreational Fishing Regulations

Changes in recreational measures will affect anglers across all modes and will affect charter/party operators directly, through regulatory action, or indirectly, through reduced passenger loads, if any one measure causes anglers to choose to reduce their fishing activity. Of the proposed recreational measures, the change in the minimum fish size for Atlantic cod would affect all recreational anglers while the seasonal change and imposition of the party/charter GOM cod trip limit would affect only those anglers in the Gulf of Maine. The year-round exemption letter would have a direct affect on charter/party operators.

Economic effects on anglers are manifested in a reduction in the value or satisfaction that they derive from taking a recreational fishing trip. If the primary motivation for fishing is based on catching fish, then changes in measures affecting keep rates without affecting catch may have a relatively small impact on recreational fishing value. Conversely, to the extent that anglers are motivated primarily by keeping fish, measures that affect keep rates would result in comparatively greater loss in economic value. Research indicates that recreational anglers are motivated by a variety of different factors, but it may be assumed that groundfish anglers are more motivated by keeping fish rather than for sport.

Data to determine the welfare loss associated with the proposed measures are not available. However, the combined effects of any given alternative having varying degrees of bag limit changes and an increased size limit may be expected to substantially reduce keep opportunities for anglers that target cod and would, therefore, result in a corresponding reduction in recreational fishing value. This reduced value may be partially offset by substitution of alternative target species, but this would still result in some welfare loss, assuming that cod would have been the preferred species choice.

Of the proposed alternatives, Option 3 would likely result in least welfare loss because it would induce less change in recreational keep opportunities for all modes and for both cod stocks. Both Options 1 and 2 would result in some welfare loss relative to regulatory measures that had been in place prior to May 1, 2002. However, an ordinal ranking of these two options in terms of welfare change is difficult because Option 2 would increase keep opportunities for haddock relative to Option 1 but would impose a closed season. Under Option 1, anglers would at least be able to fish year-round. The relative difference between Options 1 and 2 would depend on angler's valuation of being able to keep more haddock for most of the year as compared to being unable to retain anything from December to March.

In addition to some loss in economic welfare, an area closure may result in fewer recreational trips being taken if no suitable alternative target species are available. Note the proposed possession and minimum fish size limits may also discourage trip-taking decisions, if anglers believe that these limits would not justify taking a trip. To the extent that anglers do take fewer trips other secondary economic impacts may accrue in the form of reduced angler expenditures.

An input/output (I/O) model was employed to assess the potential economic losses (sales, income, and employment) associated with implementation of the proposed management options, across six coastal Northeast states (ME through NY). Reductions in sales, income, and employment in these states could occur if anglers reduce fishing effort, and hence, expenditures, in response to the new regulations. Unfortunately, no empirical information is available to determine how sensitive the affected anglers might be to the proposed changes. Therefore, economic losses were estimated for two hypothetical scenarios: (1) a 25% reduction in the number of fishing trips that are predicted to be affected by implementation of the management measures from ME through NY; and (2) a 50% reduction in the number of fishing trips that are predicted to by affected from ME through NY.

Reductions in anglers' trip-related purchases will have a direct effect on the sales, income, and employment of businesses that supply goods and services to saltwater fishermen. Businesses providing these goods and services must also purchase goods and services and hire employees, which in turn, will affect the sales, income, and employment of many additional businesses.

Three levels of economic impacts result from purchases by saltwater fishermen: (1) direct, (2) indirect, and (3) induced. Direct effects occur when anglers spend money at retail and service oriented fishing businesses (e.g., purchases of ice at convenience stores or access fees paid to owners of for-hire vessels). Indirect effects occur as the retail and service sectors purchase fishing supplies from wholesale trade businesses and manufacturers, and pay operating expenditures (e.g., the retailer must purchase fishing rods from the manufacturer or wholesaler and pay electric bills). These secondary industries must then, in turn, purchase additional supplies and this cycle of industry to industry purchasing continues until the amount remaining within the region of interest is negligible. Finally, induced effects result when employees of the direct and indirect sectors make purchases from retailers and service establishments in the normal course of household consumption (e.g., convenience store employees spend money on groceries and pay federal and state taxes). The summation of direct, indirect, and induced effects are total effects.

5.4.7.1 Data and Methods

Input-output (I/O) analysis is the most common approach available for determining the direct, indirect, and induced effects associated with an overall change in economic activity in a particular region. For the analysis presented here, a ready-made regional I/O modeling system called IMPLAN Pro (Impact analysis for Planning) was used to determine the economic losses associated with the hypothetical reductions in fishing trips under each option. The IMPLAN Pro system is a widely used, nationally recognized tool that provides detailed purchasing information for 528 industrial sectors and a user-friendly media for customizing input-output models to specific applications (Minnesota IMPLAN Group, Inc. 1997).

Angler expenditures in the Northeast (NE) by state and mode for marine fishing were obtained from Steinback and Gentner (2001). These expenditure data were produced from extensive surveys of marine recreational fishermen in the NE in 1998. The surveys were conducted as part of the Marine Recreational Fisheries Statistics Survey (MRFSS). Average fishing trip expenditures were provided for each state and mode of fishing (i.e., private boat, party/charter, and shore) in the NE in 1998. Trip-related expenditure categories shown in the report included food, lodging, travel costs, boat fuel, party/charter fees, access or boat launching fees, equipment rental, bait, and ice. In addition to trip-related expenditures, Steinback and Gentner (2001) also estimated anglers' expenditures for semi-durable items (e.g., rods, reels, lines, clothing, etc.) and durable goods (e.g., motor boats, vehicles, etc.). However, expenditures for these items are not likely to change after implementation of the proposed regulations since semi-durable and durable items can be used for many fishing trips. Thus, in the analysis presented here, it is assumed that the proposed management measures will only affect anglers' trip-related expenditures.

The economic losses associated with reductions in private boat and party/charter angler expenditures[4] were estimated by applying the product of the estimated number of affected trips and the average trip expenditure estimates from Steinback and Gentner (2001) to the appropriate IMPLAN sector multipliers in each state. The multipliers measure the direct, indirect, and induced relationships between industries and households. Input-output models require all values to be in producer prices (manufacturer prices) so each of the angler expenditure categories was associated with its corresponding IMPLAN producing sector. In IMPLAN, margins are used to convert the retail-level prices paid by anglers into the appropriate producer values. Margins ensure that the correct value is assigned to products as they move from producers, to wholesalers, through the transportation sectors, and finally on to retail establishments.

[4]Anglers that fish for cod from the shore are not projected to be affected by the measures proposed under the three options.

Economic losses were estimated for sales, income, and employment. Sales reflect the aggregate reductions in total dollar sales generated from expenditures by anglers across the six coastal states. Income represents the aggregate reductions in wages, salaries, benefits, and proprietary income generated from angler expenditures across the coastal states. Employment includes both full-time and part-time workers and is expressed as aggregate reductions in total jobs across states.

5.4.7.2 Results

The projected economic losses in the six coastal NE states associated with the hypothetical reductions in affected marine recreational fishing trips are shown in Table 293. The measures proposed under option 3 result in the lowest sales, income, and employment losses because this option is projected to affect the fewest fishing trips. A 25 % reduction in fishing trips that are projected to be affected by option 3 results in a total loss of $306 thousand in sales, $125 thousand in income, and about 8 jobs in the six coastal NE states. The losses are about twice as high given a 25% reduction in fishing trips that are affected by the more restrictive option 1 measures ($642 thousand in sales, $261 thousand in income, and 17 jobs). The projected losses under the option 2 measures are even higher. The same pattern results given the hypothetical 50% reduction in affected trips because the measures proposed under option 2 affect the fewest trips, followed by those proposed under option 1, and finally, those proposed under option 3.

If the measures proposed under the three options induce reductions in fishing effort, approximately 80% of the total sales, income, and employment losses are projected to be generated by anglers fishing aboard party and charter boats. Losses associated with reductions in angler expenditures that fish from private boats are projected to comprise 20% of the total reduction in sales, income, and employment. This is because party/charter anglers spend more, on average, then private boat anglers, and the measures proposed under all three options effect more party/charter trips than private boat trips.

	Option 1		Option 2		Option 3	
Mode of Fishing	25% Reduction	50% Reduction	25% Reduction	50% Reduction	25% Reduction	50% Reduction
	Sales (thousand dollars)					
Party/Charter	502	1,004	559	1,118	233	466
Private Boat	139	279	138	276	73	146
Total	642	1,283	697	1,394	306	612
	Income (thousand dollars)					
Party/Charter	204	407	227	453	94	189
Private Boat	58	116	57	115	30	61
Total	261	523	284	568	125	250
	Employment (jobs)					
Party/Charter	13	27	15	30	6	12
Private Boat	3	7	3	7	2	4
Total	17	33	18	36	8	16

Table 293 - Projected economic losses associated with hypothetical reductions in affected marine recreational fishing trips across six coastal states in the Northeast (ME through NY), by mode.

Estimates shown are in 1998 dollars

5.4.7.3 Summary

The measures proposed under all three management options will affect a portion of the recreational fishing trips that catch Atlantic cod. Unfortunately, although we can generally predict how many trips will be affected by the proposed measures, we do not know how anglers' trip taking behavior will change in response to the additional restrictions. If the measures result in an overall reduction in angler effort, expenditures associated with these trips will be foregone, and reductions in sales, income, and employment will occur for businesses that supply goods and services to saltwater fishermen. In addition, the sales, income, and employment of many businesses that supply the directly affected businesses could also decline. On the other hand, if the proposed measures do not induce a change in overall angler effort, total angler expenditures would remain unchanged, and there would be no effect on supporting businesses.

Given the uncertainty surrounding how anglers will respond to the proposed measures, total potential reductions in sales, income, and employment to businesses in six coastal NE states (ME to NY) were estimated for two hypothetical scenarios: (1) a 25% reduction in the number of fishing trips that are predicted to be affected by implementation of the management measures; and (2) a 50% reduction in the number of fishing trips that are predicted to by affected. Losses are predicted to range from $306 thousand in sales, $125 thousand in income, and 8 jobs under a 25% reduction for option 3 to $697 thousand in sales, $284 thousand in income, and 18 jobs under a 25% reduction for option 2. Losses associated with a 50% reduction in affected trips are projected to be about double those shown for the 25% reduction scenario under all three management options.

The projected economic losses shown here do not capture losses borne by individual anglers. The input-output approach followed in this analysis projects the change in goods and services produced by different businesses that are linked to purchases by marine anglers, but it does not provide estimates of angler welfare losses. These welfare losses are generally defined as the additional value above opportunity costs (usually taken to be expenditures of time and money) that anglers would be willing to pay in order to fish. Angler welfare values are intrinsically connected to many variables, including the potential size distribution of the catch and keep rates. Therefore, since the proposed measures include more restrictive possession and size limits, it is likely that angler welfare values will decline for at least some of the anglers that fish for Atlantic cod.

5.4.7.4 Charter/Party Impacts

Charter/party operators would be directly affected by the enrollment requirement, and indirectly affected, should any one of the recreational measures result in a reduction in passenger demand. The enrollment program would remove the possibility of a charter/party vessels switching back-and-forth between commercial fishing and carrying passengers for hire for those vessels that still want to be able to take recreational passengers into any one of the rolling closure areas. Vessels that forego the exemption program would still be able to switch between commercial and recreational activities, but may sacrifice some charter/party business to competitors if catch rates are actually higher, or even perceived to be higher, inside the closed areas.

A review of relative dependence on passenger income vis a vis commercial fishing income suggests that most operators in the Gulf of Maine derive the majority of total income from the party/charter business.

These vessels would not likely be impacted by an enrollment program since they do not depend on commercial fishing income. Further, experience in past enrollment programs under similar circumstances suggests that enrollees had relatively little commercial fishing income (only 7 of the 27 enrollees in 1999 and 2 of 23 enrollees in 2000).

Given the increase in the minimum size limit, charter/party vessels may experience a reduction in passenger demand. However, the minimum fish size increase will have a relatively small effect on charter/party keep opportunities. Experience following implementation of the minimum fish size increase in 1996 and 1997 indicates that passengers and trips have been increasing over the past 2-3 years. Further, among alternative management measures, size limits are generally supported by the recreational fishing public. Therefore, the change in minimum size does not seem likely to result in a substantial reduction in passenger demand for charter/party trips in the GOM or GB.

All options would continue a bag limit on charter/party anglers fishing for Atlantic cod in the GOM. Industry representatives have indicated in the past that passenger demand is, in part, driven by angler expectations and that one important component of angler expectations is the opportunity to have a big trip. As the argument goes, even though these expectations are realized on only a small fraction of trips, imposition of a bag limit would cause individuals to lose interest in taking a charter/party trip. The extent to which anglers would respond in the manner described is not known, nor have there been any studies that document angler response to changes in charter/party bag limits. Party/charter VTR data for FY2002 may provide some insight into the issue but as of now these data are not yet available.

Based on VTR reports, the number of charter/party operators reporting trips where GOM cod were landed ranged between 103 and 114 from 1997 to 2000. Of these vessels, approximately 20 percent, in any given year, took 60 percent of total trips that landed GOM cod, carried 70 percent of total passengers on those trips, and landed 80 percent of the total GOM cod. Thus, it is likely that the majority of economic impacts will be borne by the 20-25 operators whose primary business is in offering groundfish trips to their recreational fishing customers.

5.4.8 Economic Impacts of Alternatives to Minimize Adverse Effects of Fishing on Essential Fish Habitat

This impact assessment characterizes the magnitude of social and economic impacts likely to result from the alternatives considered in the Draft Environmental Impact Statement for the Essential Fish Habitat Components of Amendment 13 to the Northeast Multispecies Fishery Management Plan.

5.4.8.1 Methods and Data

Potential economic impacts of the EFH closure options were analyzed using Arcview GIS software. Location information from the VTR data base was used to determine which trips were reported as having taken place during calendar year 2001 within any given closure area. Revenues associated with any affected trip were assumed to be lost. All other things being equal, this "no displacement" assumption is likely to result in an upper bound estimate of revenue impact since vessels would attempt to maintain fishing incomes by redirecting effort to alternative fishing locations. In addition to this assumption a number of other assumptions were also required.

Price or value information is not recorded on VTRs. An estimate of trip value was obtained by assigning a monthly average price by species calculated from dealer data to reported landings. Although this approach would account for seasonality in average prices, it would not capture price differences across ports or premiums that individual vessels may receive for product quality or by market categories. Industry level impacts would not be appreciably affected by using an average price but impact assessments would be biased with increasing levels of disaggregation. Unfortunately, it is not possible to determine the directionality of bias as it may be port- or even vessel-specific.

The potential difficulties with using VTR data have been documented elsewhere but the most important issue affecting the social and economic impact assessment is associated with reported location information. Principle concerns with location information (i.e. latitude – longitude) include 1) no reported location, 2) misreported or miscoded location, and 3) assignment of an entire trip to a single latitude-longitude coordinate. Approximately 23% of all records representing about one-third of the estimated total value of landings either did not record any location information or could not be plotted within coastal or EEZ waters of the Northeast region and had to be discarded. Note that just because a record could be plotted, does not necessarily mean that the location for that particular trip was either accurately reported or correctly coded. Further, since only a single location coordinate is provided in the VTRs it is not possible to take into account impacts on trips that may have transited through a closure area. The latter is particularly problematic for mobile gear. Given these considerations, VTR data that were retained for analysis should be regarded as a sample of potentially affected effort and that the impacts of any given habitat option may be underestimated.

A final consideration is the fact that VTR data include information only for Federal permit holders that are subject to mandatory reporting. Some habitat options (Alternative 5A,-D in particular) include closure areas that would affect state waters fisheries. The relative amount of state waters activity that would be affected is not known.

As noted above, omitted data will tend to result in a downward bias in estimated social and economic impacts. However, also as noted previously, the assumption of no effort displacement would tend to result in an upward bias in estimated impacts. The relative contribution of these two counterbalancing effects is not known with certainty. If there is no systematic bias in the omitted data then the relative impacts for the omitted trips should be similar to that of the included trips. If this is the case, then the computed relative change in gross revenues for the included trips would be representative of the fishery as a whole. This would also provide some indication as to the potential effort displacement that would be needed in order to offset the habitat closure losses.

The potential impacts on the surf clam/ocean quahog fishery were evaluated separately using methods similar to that which was used for other fisheries. However, because landings in the clam VTRs are reported in bushels rather than pounds, an average price from dealer records (reported in terms of $ per pound meat weight) could not be assigned. For this reason impacts are reported in physical rather than dollar units and are aggregated at the state level.

5.4.8.2 Aggregate Analysis

For all VTR records retained for analysis, the total estimated gross revenue from all species reported during calendar year 2001 was $296.3 million. For a Level 1 habitat closure the relative change in total gross revenues ranged from a low of 1.3% for Alternatives 6 and 10B to a high of 12.8% for Alternative 5b (Table 1). The remaining alternatives all ranged between 1.4 and 8% in total revenue impact with little appreciable difference between Alternatives 3a (7.8%) and 3b (7.4%); Alternatives 6 (1.3%), 10A (1.4%) and 10B (1.3%) or between Alternatives 4 (5.3%) and 5d (5.6%)

Alternative	Total Revenue Loss	Monkfish Revenue Loss	Scallop Revenue Loss	Squid/Whiting Revenue Loss	Other Species Revenue Loss	Groundfish Revenue Loss	Fluke, Scup, Black Sea Bass Revenue Loss
Alternative 3a	7.8%	6.0%	6.5%	0.1%	5.7%	17.4%	0.1%
Alternative 3b	7.4%	5.1%	6.5%	0.1%	5.4%	16.1%	0.1%
Alternative 4	5.3%	3.5%	3.3%	0.1%	4.2%	13.4%	0.1%
Alternative 5a	6.7%	18.3%	1.4%	2.9%	6.5%	13.7%	4.5%
Alternative 5b	12.8%	18.2%	10.8%	3.3%	11.4%	21.6%	1.9%
Alternative 5c	8.4%	16.4%	1.5%	3.3%	12.7%	16.3%	4.7%
Alternative 5d	5.6%	11.1%	1.0%	0.8%	5.4%	13.4%	5.6%
Alternative 6	1.3%	1.8%	0.3%	0.2%	3.5%	1.7%	0.1%
Alternative 10A	1.4%	3.6%	0.4%	0.1%	2.9%	1.6%	0.1%
Alternative 10B	1.3%	3.6%	0.4%	0.1%	1.9%	1.8%	0.1%

Table 294 - Relative Loss in Gross Revenues by Alternative for Level 1 Habitat Closure

Revenue impacts across species were more varied across alternatives than total revenue impacts. The impact on monkfish revenue was between 11 and 18% under any of the variants of Alternative 5 a-d. By contrast, scallop revenue impacts were largest under Alternative 5b (10.8%) but were less than 1.5% for Alternatives 5a, c, and d. Revenue losses for small mesh fisheries for whiting and squid were similar (about 3%) for Alternatives 5a, b, and c but were less than 1% for all others. Revenue losses for combined "other" species (dogfish, skates, lobster, shrimp, herring, mackerel, tunas, and clams) were greatest for Alternatives 5b (12.7%) and 5c (11.4%) but were similar all other habitat alternatives (from 3.5 to 6.5%). Revenue losses for groundfish were highest for Alternative 5b (21.6%) and lowest for Alternative 10A (1.6%). With only a few exceptions revenue losses for groundfish exceeded that of all other species across all alternatives. Revenue losses for combined summer flounder, black sea bass, and scup were 0.1% for all alternatives other than the variants of Alternative 5. Among these alternatives, revenue losses were similar for Alternatives 5a, c, and d.

A Level 3 habitat closure would mitigate revenue impacts on stationary bottom tending gear, and as a result, total revenue impacts would be lessened. The revenue losses for a Level 3 closure ranged from 8.1% (Alternative 5b) to 0.5% (Alternatives 6, 10A and 10B) (Table 295). Compared to the Level 1 closure effects, the revenue losses for the remaining alternatives were lowered by about 1 to 2%. However, revenue losses for specific species groups were substantially reduced. Since a large proportion of monkfish are landed with gillnet gear the Level 3 closure would mitigate a substantial proportion of estimated monkfish revenue losses. Similarly, revenue losses for the "other" species group would be mitigated under a Level 3 closure because a significant proportion of these revenues are comprised of lobster using trap gear. Revenue losses for groundfish would be partially offset by a Level 3 closure since gillnet and hook segments of the groundfish fishery would not be affected. However, trawl gear accounts for the majority of groundfish effort so groundfish revenue losses would still range between 9 and 14% for all alternatives except Alternatives 6, 10A, and 10B.

Alternative	Total Revenue Loss	Monkfish Revenue Loss	Scallop Revenue Loss	Squid/Whiting Revenue Loss	Other Species Revenue Loss	Groundfish Revenue Loss	Fluke, Scup, Black Sea Bass Revenue Loss
Alternative 3a	6.1%	2.9%	6.5%	0.1%	1.8%	14.1%	0.1%
Alternative 3b	5.9%	2.7%	6.5%	0.1%	1.8%	13.3%	0.1%
Alternative 4	4.0%	2.2%	3.3%	0.0%	0.9%	11.3%	0.1%
Alternative 5a	3.8%	6.3%	1.4%	2.9%	1.0%	10.6%	4.4%
Alternative 5b	8.1%	6.3%	10.8%	3.3%	1.4%	14.0%	1.9%
Alternative 5c	4.5%	6.4%	1.5%	3.3%	1.1%	13.3%	4.6%
Alternative 5d	3.1%	3.4%	1.0%	0.7%	0.7%	9.3%	5.6%
Alternative 6	0.5%	0.6%	0.3%	0.2%	0.2%	1.3%	0.1%
Alternative 10A	0.5%	0.5%	0.4%	0.1%	0.1%	1.1%	0.1%
Alternative 10B	0.5%	0.5%	0.4%	0.1%	0.2%	1.2%	0.0%

Table 295- Relative Loss in Gross Revenues by Alternative for Level 3 Habitat Closure

Overall, the relative difference between a Level 1 and Level 3 habitat closure mitigates about 22% of total revenue losses for Alternatives 3a, 3b, and 4 (Table 296). For the Alternative 5 variants the revenue losses are reduced by as much as 46% (Alternative 5c). Much of this reduction in revenue impact is associated with savings of monkfish gillnet and lobster trap fishery revenues. A Level 3 habitat closure would have the largest mitigating effect on Alternatives 6, 10A, and 10B.

Alternative	Level 1	Level 3	Reduced Impact ($)	Reduction in Loss (%)
3a	23,237,630	18,098,883	5,138,747	22%
3b	22,042,497	17,498,370	4,544,127	21%
4	15,599,271	11,970,233	3,629,039	23%
5a	20,251,311	11,730,565	8,520,746	42%
5b	38,394,041	24,470,730	13,923,311	36%
5c	25,289,695	13,780,403	11,509,291	46%
5d	16,738,994	9,208,996	7,529,998	45%
6	3,990,045	1,436,544	2,553,501	64%
10A	4,162,998	1,345,937	2,817,060	67%
10B	3,768,834	1,570,002	2,198,832	58%

Table 296-Summary of Revenue Impacts by Alternative and EFH Level

As a share of total revenue loss, groundfish losses for a Level 1 closure range from a low of 24% for Alternative 10A to a high of 54% for Alternative 4 (Table 297). Revenue losses for scallops represent about one-quarter of revenues loss for Alternative 4 and nearly one-third of total losses for Alternatives 3a, 3b, and 5b. Monkfish revenue losses were 7% or less of total revenue losses for Alternatives 3a, 3b, and 4 but were at least 12% of revenue losses for all other alternatives.

		Groundfish	Scallops	Monkfish	Fluke, Black Sea Bass, Scup	Squid & Small Mesh Species	Other Species	TOTAL Impacted Revenue ($)
Alternative 3a - Level 1								
	Revenue Impact ($)	10,904,690	7,318,420	1,668,378	15,620	20,344	3,310,211	23,237,630
	Species Composition	47%	31%	7%	0%	0%	14%	100%
Alternative 3b - Level 1								
	Revenue Impact ($)	10,136,865	7,318,388	1,427,218	14,734	16,682	3,128,610	22,042,497
	Species Composition	46%	33%	6%	0%	0%	14%	100%
Alternative 4 - Level 1								
	Revenue Impact ($)	8,402,133	3,745,135	974,107	7,241	14,165	2,456,489	15,599,271
	Species Composition	54%	24%	6%	0%	0%	16%	100%
Alternative 5a - Level 1								
	Revenue Impact ($)	8,604,370	1,523,482	5,135,916	580,410	638,225	3,768,908	20,251,311
	Species Composition	42%	8%	25%	3%	3%	19%	100%
Alternative 5b - Level 1								
	Revenue Impact ($)	13,546,825	12,127,363	5,113,116	251,356	715,909	6,639,472	38,394,041
	Species Composition	35%	32%	13%	1%	2%	17%	100%
Alternative 5c - Level 1								
	Revenue Impact ($)	10,256,766	1,715,651	4,594,475	608,500	713,251	7,401,051	25,289,695
	Species Composition	41%	7%	18%	2%	3%	29%	100%
Alternative 5d - Level 1								
	Revenue Impact ($)	8,429,188	1,171,439	3,122,150	728,520	173,095	3,114,603	16,738,994
	Species Composition	50%	7%	19%	4%	1%	19%	100%
Alternative 6 - Level 1								
	Revenue Impact ($)	1,084,064	317,438	493,238	12,040	47,490	2,035,776	3,990,045
	Species Composition	27%	8%	12%	0%	1%	51%	100%
Alternative 10A - Level 1								
	Revenue Impact ($)	1,019,675	419,766	1,002,691	8,953	32,103	1,679,810	4,162,998
	Species Composition	24%	10%	24%	0%	1%	40%	100%
Alternative 10B - Level 1								
	Revenue Impact ($)	1,114,604	467,478	1,022,028	8,259	29,627	1,126,836	3,768,834
	Species Composition	30%	12%	27%	0%	1%	30%	100%

Table 297- Summary of Revenue Impact and Species Composition by Alternative for Level 1 Habitat Closure

		Groundfish	Scallops	Monkfish	Fluke, Black Sea Bass, Scup	Squid & Small Mesh Species	Other Species	TOTAL Impacted Revenue ($)
Alternative 3a - Level 3								
	Revenue Impact ($)	8,877,534	7,318,195	817,943	15,563	14,610	1,055,072	18,098,916
	Species Composition	49%	40%	5%	0%	0%	6%	100%
Alternative 3b - Level 3								
	Revenue Impact ($)	8,352,921	7,318,162	749,389	14,677	12,751	1,050,470	17,498,370
	Species Composition	48%	42%	4%	0%	0%	6%	100%
Alternative 4 - Level 3								
	Revenue Impact ($)	7,083,424	3,745,135	605,961	7,241	10,402	518,069	11,970,233
	Species Composition	59%	31%	5%	0%	0%	4%	100%
Alternative 5a - Level 3								
	Revenue Impact ($)	6,656,445	1,523,459	1,754,054	571,846	624,794	599,968	11,730,565
	Species Composition	57%	13%	15%	5%	5%	5%	100%
Alternative 5b - Level 3								
	Revenue Impact ($)	8,802,649	12,122,901	1,767,312	241,156	711,388	825,325	24,470,730
	Species Composition	36%	50%	7%	1%	3%	3%	100%
Alternative 5c - Level 3								
	Revenue Impact ($)	8,369,198	1,711,535	1,780,301	594,947	707,512	616,910	13,780,403
	Species Composition	61%	12%	13%	4%	5%	4%	100%
Alternative 5d - Level 3								
	Revenue Impact ($)	5,820,160	1,167,018	948,627	724,650	158,927	389,615	9,208,996
	Species Composition	63%	13%	10%	8%	2%	4%	100%
Alternative 6 - Level 3								
	Revenue Impact ($)	789,433	317,438	161,112	9,749	45,082	113,730	1,436,544
	Species Composition	55%	22%	11%	1%	3%	8%	100%
Alternative 10A - Level 3								
	Revenue Impact ($)	686,935	419,766	133,260	6,530	29,644	69,802	1,345,937
	Species Composition	51%	31%	10%	0%	2%	5%	100%
Alternative 10B - Level 3								
	Revenue Impact ($)	781,864	467,478	152,598	5,836	27,168	135,057	1,570,002
	Species Composition	50%	30%	10%	0%	2%	9%	100%

Table 298- Summary of Revenue Impact and Species Composition by Alternative for Level 3 Habitat Closure

Since a Level 3 habitat closure does not provide any relief to fisheries using mobile bottom-tending gear the share of revenue impact for fisheries that are dominated by these mobile gears increases relative to other fishery impacts. For example, the combined share of groundfish and scallop revenue losses is at least 70% for all Alternatives and is as much as 90% of revenue impact for Alternative 4 (Table 298).

For the surf clam/ocean quahog fishery, aggregate landings from retained VTR records were 5.6 million bushels for calendar year 2001. Based on locations provided in these data no trips were reported as having occurred inside the confines of any of the specified habitat closure for Alternatives 3a, 3b, or 4. Therefore, the habitat closures for these three alternatives would have no impact on the surf clam/ocean quahog fishery. The remaining alternatives would affect between 2 and 7% of total fishery landings (Table 299).

State	Total Bushels	Alternative 3a, 3b, & 4	Alternative 5a	Alternative 5b	Alternative 5c	Alternative 5d	Alternative 6	Alternative 10A & 10B
MA	936,236	0	4.1%	11.0%	11.0%	8.8%	40.7%	4.8%
MD	622,065	0	5.1%	0.0%	5.1%	0.0%	0.0%	0.0%
ME	108,590	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NJ	3,788,123	0	2.4%	0.4%	2.4%	0.0%	0.0%	0.0%
RI	175,920	0	0.9%	0.9%	0.9%	44.6%	0.0%	2.1%
Totals	5,630,934	0	2.9%	2.1%	4.0%	2.9%	6.8%	0.9%

Table 299 - Proportional Loss of Surf Clam/Ocean Quahog Landings (bushels) by State and Alternative

5.4.8.3 Short-term Impacts on Coastal Sub-Regions

An input/output (I/O) model was employed to assess the relative short-term economic losses (sales, personal income, and employment) associated with the proposed habitat alternatives on ten subregions in New England. This approach evolved out of collaborative research between the Marine Policy Center of the Woods Hole Oceanographic Institution and the Northeast Fisheries Science Center as part of a grant received through the Marine Fisheries Initiative (MARFIN) in 1999 (see Marine Policy Center 2000). The details of this approach (including data and methods) are described in section 5.4.6.

The results of this I/O model cannot be directly combined with the I/O results presented in section 5.4.6. This is because while both sets of measures will impact the fishing industry, the measures interact in ways that are not captured by analyzing each independently. In addition, there are significant differences between the approach used in the closed area model and that used in the habitat analysis. The closed area model allows displaced effort to be used in other areas, while the habitat model assumes all displaced effort vanishes. It may be possible, once final management choices are made, to combine the two analyses in a way that captures the total impacts on coastal sub-regions.

5.4.8.3.1 Impact Assessments

In the I/O model presented here, total economic impacts are calculated by applying estimates of direct revenue changes to IMPLAN generated multipliers that measure the indirect and induced relationships between industries and households in each subregion. Therefore, prior to calculating the total estimated losses (direct + indirect + induced) of each alternative, it was necessary to determine the direct revenue changes associated with the gear sectors, the seafood dealer sector, and the seafood processing sector in each subregion.

Direct revenue losses for the affected trips were summed by gear sector in each subregion. Direct revenue losses associated with seafood dealers in each subregion were estimated in the following manner. First, the summation of the estimated direct revenue losses associated with the harvesting sectors in each subregion were multiplied by the proportion of total dealer purchases that were derived from local harvesters (i.e, purchased from harvesters within a particular subregion). This results in an estimate of the value of seafood harvested in a particular subregion that was purchased by seafood dealers in that same subregion. The proportions used in these calculations were determined from the Northeast dealer data base and ranged from a low of .17 for New Hampshire Seacoast dealers to a high of .99 for Upper Mid-Coast Maine dealers. The remainder of purchases by seafood dealers were derived from imports (i.e., purchased from outside a particular subregion) and assumed to be unaffected by the proposed management measures. Although a small portion of the imports may have been purchased from the affected gear sectors in neighboring subregions, these effects are not part of this analysis since separate models were constructed for each subregion. Secondly, the results from the first step were multiplied by the dealer mark-ups or margins in each subregion to obtain the estimated direct revenue losses for seafood dealers in each subregion.

For purposes of this analysis, seafood processors in each subregion were also estimated to be directly impacted by the proposed habitat alternatives. According to IMPLAN default data it was estimated that about 60% of the total value sold by seafood dealers within each subregion was actually purchased by seafood processors in those same subregions. Thus, in the subregional models, 40% of the dealer sales in value were assumed to be exported out of each subregion, either as domestic or foreign exports, and thus were not available to be purchased by local seafood processors or any other sectors in the model. In this analysis it was assumed that only the seafood processing sector purchases fish from seafood dealers. Several other sectors purchase fish as an input into their production process, such as eating and drinking establishments, hospitals, hotels and lodging, and amusement and recreation services, but it was assumed that these establishments purchase from seafood processors and not seafood dealers. As such, the estimated direct revenue losses for the seafood dealer sectors were multiplied by 0.6 to obtain the value of fish purchased by seafood processors within each subregion. These values were then multiplied by the appropriate seafood processing margins to obtain the estimated direct revenue losses for seafood processors in each subregion. Seafood processing margins were calculated by subtracting the seafood dealer coefficient in the processing production function from one. This margin measures the additional value seafood processors charge to cover their fixed and variable operating costs (including profits and taxes).

After the direct revenue losses were estimated for each gear sector, the seafood dealer sectors, and the seafood processing sectors within each subregion, total economic losses were calculated by applying the revenue losses to the appropriate IMPLAN generated multipliers. Note that losses associated with seafood dealers exclude the losses associated with the commercial harvesting gear sectors, and the losses associated with seafood processors exclude those attributable to the seafood dealers and the commercial harvesters. Thus, the losses associated with reductions in supply to these sectors can be summed to obtain the total effect on sales, income, and employment within each subregion.

No attempt was made to estimate forward linked impacts beyond the processing sector because reductions in groundfish supply at the harvesting level are not likely to significantly alter the cost restaurants, hospitals, and supermarkets pay for groundfish in each subregion. In fact, according to data contained within IMPLAN, less than 2% of the processed seafood purchased by upstream industries is actually derived from processors within each subregion. According to this data, imports from other areas supply the majority of retail-level purchases from processors. Although retail-level purchases of locally processed groundfish may differ from these statistics, it was assumed that no forward-linked impacts would occur in each subregion beyond the seafood processing sector. Note also that the impact assessment was conducted only for the Level 1 habitat closure options. For this reason the reported results should be regarded as an upper bound estimate on potential economic impacts.

5.4.8.3.2 Results

The Input/Output model used for this analysis was based on a set of sub-regional models for New England states only. A similar modeling framework is currently under development for the Mid-Atlantic region but is not available at this time. Therefore, the economic impacts associated with any one of the habitat alternatives that accrue to regions outside of the New England area could not be estimated. This omission may be particularly problematic for Alternatives 5a – d because these alternatives include closures that would impact several fisheries that are important to states in the Mid-Atlantic region.

The total direct impact of any given habitat alternative is the sum of the commercial fishing, seafood dealer, and seafood processing sector revenue losses. The sum of these New England coastal region losses plus the multiplier effects of the indirect and induced impacts ranged from $12.4 million for Alternative 10B to $150.3 million for Alternative 5b (Table 300). The gross sales impacts for Alternative 3a, 3b, and 5c were similar at approximately $100 million. Gross sales impacts for Alternatives 4, 5a, and 5d were also similar in magnitude averaging about $68 million while sales impacts for Alternatives 6, 10A, and 10B all ranged between $12.4 and $15.6 million.

The total loss of New England coastal region income ranged from a low of $4.4 million for Alternative 6 to a high of $43.1 million for Alternative 5b (Table 301). As was the case for gross sales there were only small differences in income impacts between Alternatives 3a, 3b, and 5c ($28 to $30 million). There were also relatively small differences in income impacts for Alternatives 4, 5a, and 5d ($19 to $21 million). Likewise there were only small differences in income impacts for Alternatives 6, 10A, and 10B.

The total employment impacts followed a pattern similar to that of the sales and income impacts with Alternative 10B resulting in the lowest employment impact (175 jobs) and Alternative 5b affecting more than two thousand jobs. Alternative 3a and 3b would affect about 1,400 jobs and Alternative 5c would affect 1,300 jobs. Alternatives 4, 5a, and 5d would affect between 850 and 1,000 jobs.

Sector	Alt 3a	Alt3b	Alt 4	Alt 5a	Alt 5b	Alt 5c	Alt 5d	Alt 6	Alt 10A	Alt 10B
Commercial Fishing	Sales ($1000's)									
Bottom Long-Longline	-1,992	-1,931	-1,760	-723	-2,138	-843	-806	-380	-905	-287
Gillnet	-2,127	-1,745	-1,078	-4,645	-5,894	-4,036	-4,401	-606	-658	-861
Large Trawl	-8,859	-8,818	-7,286	-4,148	-5,505	-4,388	-2,001	-833	-166	-140
Medium Trawl	-1,226	-1,025	-814	-2,718	-2,733	-3,385	-2,870	-139	-86	-86
Small Trawl	-539	-181	-70	-1,716	-3,416	-2,908	-2,438	-64	-192	-240
Lobster Traps	-980	-826	-751	-1,390	-4,619	-5,097	-1,714	-1,497	-123	-123
Large Scallop Dredge	-6,842	-6,842	-3,293	-595	-7,626	-581	-373	-204	-51	-51
Medium Scallop Dredge	-330	-330	-330	-393	-908	-401	-395	-111	-1,183	-1,183
Small Scallop Dredge	-200	-200	-74	-355	-1,264	-534	-387	-51	-3	-3
Pots and Traps	0	-2	0	-8	-16	-13	-10	-3	-702	-702
Agriculture	-203	-192	-156	-181	-404	-239	-177	-50	-85	-77
Mining	-1	-1	-1	-2	-4	-4	-2	0	-1	-1
Construction	-799	-759	-534	-544	-1,158	-751	-501	-118	-178	-147
Manufacturing	-1,137	-1,057	-730	-823	-1,709	-1,249	-820	-190	-372	-323
Fresh and Frozen Seafood Processing	-24,351	-23,068	-16,192	-16,375	-35,704	-23,570	-15,460	-3,558	-2,385	-2,155
Manufactured Ice	-343	-339	-232	-182	-386	-213	-132	-20	-23	-24
Cordage and Twine	-1	-1	0	-18	-21	-20	-5	0	-5	-5
Paperboard Containers and Boxes	-737	-695	-463	-427	-963	-649	-407	-86	-144	-131
Transportation, Communications and Public Utilities	-1,967	-1,868	-1,335	-1,375	-2,857	-1,884	-1,262	-283	-403	-372
Motor Freight Transport and Warehousing	-894	-858	-602	-566	-1,201	-784	-497	-127	-173	-157
Water Transportation	-2,514	-2,357	-1,659	-2,112	-4,062	-2,818	-2,038	-379	-450	-445
Trade	-3,848	-3,670	-2,526	-2,482	-5,500	-3,395	-2,265	-564	-595	-557
Seafood Dealers	-28,031	-26,594	-18,674	-18,708	-40,815	-26,778	-17,554	-4,090	-1,609	-1,453
Wholesale Trade	-3,780	-3,567	-2,463	-2,522	-5,259	-3,540	-2,343	-516	-655	-588
Finance, Insurance and Real Estate	-3,970	-3,743	-2,650	-2,920	-5,972	-4,158	-2,755	-662	-970	-895
Services	-629	-593	-409	-430	-903	-569	-400	-93	-1,459	-1,337
Government	-23	-21	-16	-20	-40	-30	-20	-4	-103	-96
Other	-6,139	-5,769	-4,125	-4,591	-9,247	-6,455	-4,348	-956	-6	-6
Total	-102,464	-97,051	-68,226	-70,968	150,324	-99,292	-66,382	-15,586	-13,691	-12,445

Table 300- Total New England Coastal Region Sales Impacts

Sector	Alt3a	Alt 3b	Alt 4	Alt 5a	Alt 5b	Alt 5c	Alt 5d	Alt 6	Alt 10A	Alt 10B
Commercial Fishing	Income ($1000's)									
Bottom Long-Longline	-664	-644	-587	-241	-713	-281	-269	-127	-375	-121
Gillnet	-898	-711	-413	-1,785	-2,882	-2,098	-1,734	-173	-380	-497
Large Trawl	-5,111	-5,087	-4,203	-2,393	-3,176	-2,531	-1,155	-481	-71	-60
Medium Trawl	-525	-439	-348	-1,161	-1,167	-1,448	-1,227	-55	-30	-29
Small Trawl	-179	-61	-23	-540	-994	-963	-799	-21	-70	-87
Lobster Traps	-363	-293	-260	-591	-1,858	-2,298	-761	-499	-45	-45
Large Scallop Dredge	-2,482	-2,482	-1,194	-216	-2,766	-211	-135	-74	-18	-18
Medium Scallop Dredge	-120	-120	-120	-143	-329	-145	-143	-40	-630	-630
Small Scallop Dredge	-73	-73	-27	-129	-459	-194	-140	-18	-1	-1
Pots and Traps	0	-1	0	-3	-5	-5	-4	-1	-234	-234
Agriculture	-70	-67	-53	-59	-136	-79	-58	-15	-22	-20
Mining	0	0	0	-1	-1	-1	-1	0	0	0
Construction	-461	-437	-307	-315	-669	-438	-291	-67	-105	-86
Manufacturing	-299	-278	-193	-219	-455	-331	-218	-52	-105	-91
Fresh and Frozen Seafood Processing	-4,847	-4,532	-3,172	-3,466	-7,518	-5,206	-3,429	-717	-488	-441
Manufactured Ice	-171	-169	-116	-90	-192	-105	-65	-10	-12	-12
Cordage and Twine	0	0	0	-6	-7	-7	-2	0	-2	-2
Paperboard Containers and Boxes	-160	-152	-102	-89	-202	-133	-82	-18	-32	-29
Transportation, Communications and Public Utilities	-487	-462	-330	-350	-716	-483	-323	-71	-107	-99
Motor Freight Transport and Warehousing	-290	-278	-194	-183	-390	-256	-162	-41	-56	-51
Water Transportation	-598	-560	-394	-507	-977	-687	-489	-87	-106	-104
Trade	-1,970	-1,880	-1,288	-1,272	-2,836	-1,734	-1,164	-292	-300	-282
Seafood Dealers	-4,188	-3,974	-2,790	-2,795	-6,099	-4,001	-2,623	-611	-842	-760
Wholesale Trade	-1,456	-1,374	-949	-972	-2,027	-1,365	-904	-199	-253	-227
Finance, Insurance and Real Estate	-728	-685	-487	-580	-1,140	-830	-552	-141	-231	-214
Services	-210	-199	-138	-143	-301	-194	-133	-30	-812	-748
Government	-23	-21	-16	-20	-40	-30	-20	-4	-37	-34
Other	-3,381	-3,175	-2,264	-2,529	-5,088	-3,578	-2,401	-516	-6	-6
Total	-29,756	-28,153	-19,970	-20,798	-43,145	-29,635	-19,281	-4,360	-5,371	-4,931

Table 301- Total New England Coastal Region Income Impacts

Sector	Alt 3a	Alt 3b	Alt 4	Alt 5a	Alt 5b	Alt 5c	Alt 5d	Alt 6	Alt 10A	Alt 10B
Commercial Fishing	Employment (jobs)									
Bottom Long-Longline	-92	-90	-83	-27	-95	-30	-29	-16	-18	-6
Gillnet	-57	-48	-32	-120	-217	-127	-105	-11	-13	-17
Large Trawl	-310	-309	-252	-108	-166	-114	-51	-24	-3	-3
Medium Trawl	-37	-32	-26	-83	-79	-99	-84	-3	-2	-2
Small Trawl	-14	-4	-2	-49	-80	-81	-69	-2	-4	-5
Lobster Traps	-26	-22	-21	-44	-123	-134	-50	-45	-2	-2
Large Scallop Dredge	-255	-255	-122	-22	-286	-22	-14	-8	-1	-1
Medium Scallop Dredge	-11	-11	-11	-7	-32	-7	-7	-3	-23	-23
Small Scallop Dredge	-6	-6	-2	-15	-96	-21	-16	-1	0	0
Pots and Traps	0	0	0	0	-6	-1	0	0	-14	-14
Agriculture	-9	-8	-7	-8	-18	-11	-8	-2	-3	-2
Mining	0	0	0	0	0	0	0	0	0	0
Construction	-12	-12	-8	-8	-17	-11	-7	-2	-2	-2
Manufacturing	-8	-8	-5	-5	-12	-8	-5	-1	-2	-2
Fresh and Frozen Seafood Processing	-154	-147	-103	-101	-222	-144	-94	-22	-14	-13
Manufactured Ice	-4	-4	-3	-2	-5	-3	-2	0	0	0
Cordage and Twine	0	0	0	0	0	0	0	0	0	0
Paperboard Containers and Boxes	-4	-4	-2	-2	-5	-3	-2	0	-1	-1
Transportation, Communications and Public Utilities	-10	-9	-6	-7	-14	-9	-6	-1	-2	-2
Motor Freight Transport and Warehousing	-8	-8	-6	-5	-11	-7	-5	-1	-2	-1
Water Transportation	-12	-12	-8	-10	-20	-14	-10	-2	-2	-2
Trade	-103	-99	-67	-65	-145	-87	-59	-15	-14	-13
Seafood Dealers	-154	-143	-102	-129	-239	-200	-121	-24	-41	-37
Wholesale Trade	-32	-31	-21	-20	-43	-27	-18	-4	-4	-4
Finance, Insurance and Real Estate	-20	-19	-13	-14	-30	-20	-14	-4	-4	-4
Services	-4	-4	-3	-3	-7	-4	-3	-1	-21	-20
Government	-2	-2	-1	-2	-4	-3	-2	0	-1	-1
Other	-111	-104	-75	-81	-163	-111	-75	-17	0	0
Total	1,457	1,391	-982	-939	2,134	1,298	-857	-211	-194	-175

Table 302- Total New England Coastal Region Employment Impacts

Across New England sub-regions the New Bedford area (all ports within Bristol County, MA but principally the city of New Bedford itself) would bear at least two-thirds of the gross sales impacts under Alternatives 3a, 3b, and 4 (Table 303). This level of impact is largely due to the importance of New Bedford groundfish, monkfish, and scallop fisheries; fisheries that would be most affected by habitat closures. Note that with the exception of monkfish, both scallops and groundfish would still be particularly affected even by a Level 3 closure so that while the magnitude of impact would be lower, the proportional impact on the New Bedford sub-region would not be likely to change and may be even greater. Other than the New Bedford sub-region, gross sales impacts on only the Boston, Gloucester, and the Cape and Islands sub-regions would be 10% or more for any of the habitat alternatives.

Sub-Region	Alt 3a	Alt 3b	Alt 4	Alt 5a	Alt 5b	Alt 5c	Alt 5d	Alt 6	Alt 10A	Alt 10B
Upper Mid-Coast Maine	0.4%	0.4%	0.4%	2.3%	0.6%	1.7%	2.5%	1.8%	2.2%	2.3%
Lower Mid-Coast Maine	2.0%	2.1%	3.1%	2.6%	0.7%	1.6%	1.8%	10.9%	5.5%	6.6%
Southern Maine	0.0%	0.0%	0.1%	1.2%	0.5%	0.1%	0.4%	0.3%	0.6%	0.7%
New Hampshire Seacoast	1.3%	1.3%	1.5%	4.8%	2.6%	0.6%	4.3%	9.6%	11.8%	8.3%
Gloucester Area	14.1%	9.4%	6.5%	27.5%	26.8%	42.9%	45.0%	19.3%	13.7%	14.4%
Boston Area	2.7%	2.8%	3.8%	12.3%	4.2%	14.3%	9.3%	2.9%	17.1%	17.4%
Cape & Islands	10.5%	11.0%	14.6%	13.9%	17.7%	10.5%	13.4%	19.0%	8.3%	8.2%
New Bedford Area	67.7%	71.5%	68.2%	29.3%	42.2%	22.6%	14.8%	32.5%	17.2%	18.3%
Rhode Island	0.8%	0.9%	1.1%	5.6%	3.6%	4.1%	7.3%	3.2%	4.6%	4.7%
Connecticut Seacoast	0.5%	0.5%	0.7%	0.4%	1.1%	1.7%	1.2%	0.4%	8.4%	8.5%

Table 303- Relative Distribution of Gross Sales Impacts by Sub-Region

5.4.8.3.3 Summary

The impacts on gross sales, income and employment in the New England coastal would be greatest for habitat alternative 5b while either habitat alternative 6, 10A or 10B would reduce these impacts by nearly ten-fold. The impacts are likely to be an upper bound estimate since the potential impacts of Level 3 vis a vis Level 1 were not estimated. In between these extremes, the remaining alternatives form two clusters each having similar impacts within a cluster. Specifically, habitat alternatives 3a, 3b and 5c form one of these clusters with gross sales impacts of about $100 million; income losses of about $30 million; and employment losses of up to 1,400 jobs. Alternatives 4, 5a, and 5d form a second cluster with lower impacts of about $70 million in sales, $20 million in income losses, and losses of less than 1,000 jobs.

Across sub-region the Massachusetts sub-regions of New Bedford, Gloucester, Cape and Islands, and Boston account for between 70 and 90% of economic impacts regardless of alternative. The New Bedford sub-region would be particularly affected followed by Gloucester and the Cape and Islands sub-region. For New Bedford the Level 3 habitat closure may not provide substantial relief because of the importance of scallops, monkfish, and groundfish in the New Bedford seafood economy.

In general, impacts across all forms of analysis identified habitat alternative 5b as having the greatest impact and habitat alternatives 6, 10a, and 10b as having the least. In between these extremes, more severe impacts (gross sales impacts of about $100 million; income losses of about $30 million; and employment losses of up to 1,400 jobs) will result from alternatives 3a, 3b, and 5c. Less severe impacts (losses of about $70 million in sales, $20 million in income losses, and losses of less than 1,000 jobs) will result from habitat alternatives 4, 5a, and 5d.

5.4.9 Other Economic Impacts

The previous sections focused on the quantitative economic impacts of the program to rebuild overfished stocks, including estimates of the distributive impacts of the alternatives to address rebuilding requirements. There are also economic impacts of other measures, many that can only be addressed in a qualitative manner.

5.4.9.1 Rebuilding Trajectories for Overfished Stocks

The net benefits of different rebuilding trajectories are described in a previous section. As discussed, these estimates are useful for comparing different rebuilding strategies. Some issues, however, may not be captured by this quantitative assessment.

The analysis of the different trajectories assumes that target fishing mortalities are achieved. The interactions within the multispecies fishery make it difficult to precisely control fishing mortality. In any given year, mortality rates may be higher or lower on a particular stock than that designed in the rebuilding program. As an example, reducing effort to protect GB cod may inadvertently reduce mortality (and landings) of GB haddock or GB yellowtail flounder. If fishing mortality deviates from the program design, landing streams will also change and the actual economic returns may differ from those estimated. Similar economic impacts could result if actual conditions deviate from the assumptions used in the projection methodology. For example, if recruitment of a stock is significantly higher or lower than projected, resulting economic returns from that stock will also change. For the proposed action, there is a closer link between the expected impacts of the measures the proposed strategy. The projected economic impacts of the proposed action should more closely match the realized impacts.

All rebuilding trajectories result in reduced landings in the early years of rebuilding – for some stocks, significant reductions are likely. This may have impacts on the infrastructure in the fishery that is not entirely captured by the analysis. As discussed in the cumulative impacts section, loss of infrastructure to purchase and sell groundfish, or the loss of markets that results from a reduced supply of groundfish, may limit the ability of the industry to use increased landings in future years. One of the benefits of the proposed action is that the reduction in landings and revenue in the early years is less than the other strategies. This means that the impact on infrastructure may not be as great, providing a better opportunity for the industry to weather the early years of the rebuilding program and benefit from the increased landings expected in the future. While it is likely that businesses will adjust if there is a future opportunity to buy and sell increased amounts of groundfish, there may be a lag between stock rebuilding and when the industry can absorb the increased catches. Temporary periods of depressed prices (from a large supply of fish) may result. These effects may be partially captured by the price model used in estimating the economic impacts.

One aspect that all the rebuilding trajectories have in common is what happens when a stock is rebuilt. In many cases, rebuilding fishing mortality rates are lower than the rate that is allowed on a rebuilt stock. The economic analysis assumes that catches increase immediately. As discussed in the previous paragraph, a sudden increase in the supply of fish may be more than the market can efficiently absorb, and there may be a temporary period of depressed prices. This sudden increase would be most problematic for the phased reduction approach and in particular for the constant catch approach. Both of these trajectories have very low fishing mortality rates in the final years of the rebuilding program. The constant catch approach has no increase in landings as stocks increase. In contrast, the constant fishing mortality rate approach has less of a jump from the final year to the first year of fishing on a rebuilt stock. In addition, under this strategy landings gradually increase over time.

5.4.9.2 Fishery Program Administration

5.4.9.2.1 Fishing Year

The economic impact of a change on the fishing year would depend on whether or not a rebuilding alternative with a hard TAC is implemented. The proposed action did not adopt a hard TAC. Without a hard TAC a change in the fishing year would probably have minimal economic impact. Business plans would need to accommodate reduced DAS allocations but trip decisions would still be based on relative economic returns from using a DAS in May as compared to January. Presumably, a vessel that is weather limited would still choose to fish during favorable weather months regardless of when the fishing year started or ended. The proposed action did not adopt a change in the fishing year and as a result did not adopt a method to pro-rate DAS.

5.4.9.2.2 Periodic Adjustment Process

The proposed action changes the periodic adjustment process. No economic impacts on the fishery are expected under No Action or if the adjustment process is changed by combining the MSMC and the PDT. Neither of these alternatives would have any impact on the fishery but revising the PDT does have the potential to reduce administrative costs and streamline the annual adjustment process. Even though the membership of the MSMC and PDT overlaps, the responsibilities of these advisory groups as well as the timing of tasks do differ combining the responsibilities may streamline the process somewhat.

A biennial adjustment process would reduce administrative costs over time. With fewer adjustments being made the entire management process would become more stable and may reduce uncertainty over what regulatory regime will prevail over the coming year. This reduced uncertainty may enable vessel owners to make longer term planning decisions that could enhance fishery productivity and economic performance over time.

5.4.9.2.3 US/Canada Resource Sharing Understanding

The management of GB cod, haddock, and yellowtail flounder is complicated because these stocks are harvested by both U.S. and Canadian fishermen. The M-S Act requires that these stocks be managed as a unit, even though U.S. regulations only apply to fishing in U.S. waters. The total catch that can be removed must be consistent with the M-S Act, whether it is caught by U.S. or Canadian fishermen. This means that if the catch by fishermen from both countries is not carefully coordinated, the total catch may damage the resource unless stringent limits are placed on U.S. fishermen. As an egregious example, if Canadian fishermen harvested all the GB cod that can be taken consistent with the M-S Act, regulations would have to prevent U.S. fishermen from harvesting any GB cod. While this extreme example is unlikely because of the similarities between U.S. and Canadian management goals, it highlights the need to coordinate harvest levels between the two countries.

In the past, U.S. target TAC levels for these stocks were set by assuming a Canadian harvest. Often the assumed harvest did not match the actual Canadian harvest. When the assumed harvest was higher than the actual Canadian harvest, opportunities for U.S. fishermen were limited by an unnecessarily low target TAC. When the assumed harvest was less than the actual Canadian harvest, there was increased risk for exceeding biological limits that would result in further restrictions in following years.

Implementing a U.S./Canada resource sharing agreement does not change the total catch that can be taken from these stocks. It does, however, allocate a portion of that catch to each country based on an agreed formula. The primary economic benefit that results is predictability in the allowed harvest by U.S. fishermen from year to year. While catches will change because of changing resource conditions, there is a degree of certainty that the catch by respective countries will be coordinated and will not disadvantage either country. There is a reduced possibility that excessive Canadian catches will result in additional restrictions on U.S. fishermen.

The resource sharing agreement would require implementation of specific measures to assure that the domestic allocation of quota is not exceeded which would require identification of participating and monitoring of the U.S. quota as a hard TAC. A hard TAC will be implemented for a year at a time. Management if the hard TAC may use a trigger (70-90 percent of the TAC) after which a restrictive trip limit would be implemented or by using a combination of conservation measures that could include specific gear configurations, controlled access, or trip limits designed to preserve the cod TAC. Since the cod TAC would be most constraining, the difference in economic effect between these two approaches comes down which alternative would allow for the most haddock and yellowtail to be taken at least cost.

Under a hard TAC alternative once the hard TAC for a given species has been reached possession of that species may be prohibited or the area may be closed to all gears capable of catching cod, haddock, or yellowtail flounder. A prohibition on possession would still allow fishing in the area for the remaining species but may still result in discarding. A closure would provide greater assurance that any TAC overage would be minimized but would have greater economic impact.

A target TAC alternative may be implemented using a suite of measures that would become increasingly restrictive as the TAC is approached or as a suite of up-front measures that would be restrictive enough so that no in-season adjustments would be needed. The former approach would be more costly to monitor, administer, and enforce since it may require several in-season adjustments. However, the latter may be more costly to vessel owners since it would require more restrictive measures for the entire season.

Participants may be required to have a VMS unit installed or may be required to enroll in an access program. The latter would require vessels to bear the acquisition and operating cost of a VMS unit. The former would be less costly in terms of cash outlays but would reduce vessel flexibility because enrollment would be for a minimum fixed period of time.

None of the alternatives for reporting would have any appreciable impact on participating vessels. If VMS is selected then reporting via the VMS system would add no additional cost to participating vessels. If an enrollment program is selected then reporting would be through an interactive voice reporting system. This would require a phone call upon completion of a trip but this would not have any appreciable affect on operating costs.

5.4.9.2.4 Administration of Certified Bycatch/Exempted Fisheries

The proposed action allows changes in the standard for certification of a bycatch fishery. A change in the standards for certification would provide greater flexibility to accommodate specific resource conditions particularly as stocks recover. The current standard does not take into account different stock status for different species that may merit a higher standard for approval while a lower standard may be acceptable for others. This change would increase potential economic opportunities and may encourage more innovative gear designs as the focus shifts from groundfish as a complex and to the specific components that may be of particular concern.

The proposed action does not adopt a scheduled review of certified/bycatch fisheries. Proposals to establish a review schedule for certified bycatch/exempted fisheries will increase administrative costs. In addition, for participants in a bycatch/exempted fishery, costs may increase in order to collect and provide information necessary for that review. While much of the information necessary to review a fishery or gear should be provided through a combination of the normal reporting and observer programs, participants may decide to supplement this information to insure the fishery is allowed to continue.

5.4.9.2.5 Special Access Programs

The management measures required to rebuild all groundfish stocks are likely to result in reductions in fishing mortality rates that may be appropriate for some stocks while being overly restrictive for others. The special access program structure will provide economic benefits to the industry and may serve to mitigate some of the expected reductions in revenue that will result from the rebuilding programs. The application process for a SAP will create a need to collect (or collate) information on the proposed program and submit an application. This process will increase costs, but if the program is approved, presumably the economic returns will be positive.

Georges Bank Yellowtail Flounder Access Program

The Georges Bank yellowtail flounder access program will provide positive economic benefits to those vessels that can access the offshore area. This will primarily be trawl vessels, though some trip gillnet vessels may also be able to take advantage of this program. Landings of GB yellowtail flounder have reached a plateau between 3,000 – 4,000 mt. Given the large effort reduction expected to result from the rebuilding alternatives, it is likely that absent additional incentives, these landings will decline in the future. At the same time, the rebuilding stock can support a harvest of 10,000 – 12,000 mt over the next ten years. Even assuming a Canadian harvest of 3,000 mt, there is a considerable gap between recent landings and the available yield. Each 1,000 mt of yellowtail flounder is worth roughly $1- 2 million (at $.50 - $1/pound). If this program encourages enough effort to the Georges Bank area that the entire GB yellowtail TAC is taken, it will increase revenues about $3 - $6 million from the no action alternative.

The program also alleviates the DAS reductions by not charging DAS for the trip out to CAII. For a vessel making the allowed two trips per month, this is the same as adding nearly one full DAS for each month. Participation will require purchase of a VMS unit. However, a VMS requirement is also included in several other alternatives including the US/Canada resource sharing agreement which would likely involve the same vessels as that which would participate in this special access program. If not, participation would still be voluntary and would not place any obligation on any other vessels.

Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program

This incidental catch program would allow vessels that participate in the fluke fishery to increase trip income by retaining up to 200 pounds of winter flounder per trip. Vessels would have to enroll in this program for a minimum of 30 days but there would be no cost to the vessel, other than the time required to apply for the program. There is likely to be an increase in revenues for vessels that catch winter flounder while fishing for fluke. In calendar year 2001, roughly 200 mt (440,000) pounds of winter flounder were reported discarded on fluke trips. Assuming that all of these discards could be converted to legal landings (that is, none of it is undersized fish), at a price of $1.00 – 1.50 per pound, this would amount to an increase in vessel revenues of $440,000 - $660,000. These increases in revenues would accrue to vessels from the southern New England/Mid-Atlantic area, helping to mitigate the impacts of other management measures.

In addition to revenue increases resulting from converting discards into landings, this measure would also remove the requirement that vessels fishing for fluke use a DAS to land small quantities of winter flounder. Vessels would then be able to use those DAS at other times of the year on dedicated groundfish trips, further mitigating the impacts of the reductions in effort from the management program.

US/CA Resource Sharing Understanding Special Access Program

If adopted, this SAP will facilitate catching eastern GB haddock and yellowtail flounder, providing additional income to those vessel that can fish in the offshore area. The SAP is likely to be used primarily by trawl vessels because generally they are larger and travel farther offshore. All gear types, however, are eligible to participate. This program will help mitigate the impacts of the other regulations and will provide additional income to those vessels that are able to take advantage.

5.4.9.2.6 Closed Area Administration

The Council did not adopt a review of the rational for closed areas, but will require that rational be carefully specified in the future. A review of the rationale for closures would have no direct economic impact on the fishery. The cost that may be associated with conducting this review should also be relatively low. Changes to access to closed areas and any changes to current exempted gears would afford qualifying vessels with an opportunity to improve fishing income. Neither retention nor elimination of the Flexible Area Action System would result in any noticeable economic costs or benefits. While the regulatory framework exists it has not been used so its removal would not have any measurable economic impact.

5.4.9.2.7 Leasing of DAS

Leasing of DAS would provide individual vessel owners an opportunity to offset the DAS reductions that were implemented in August, 2002 and any further reductions that may become necessary upon implementation of Amendment 13. Note that all but one of the management alternatives contains a hard TAC as either a backstop or a primary effort control mechanism. Should any of the TAC alternatives be selected DAS leasing may become an unattractive business decision since there would be no assurance that the lessee would be able to use that DAS since the TAC may cause a fishery shut down. The relative impact of DAS reductions will depend on the dependence on groundfish for total fishing income and other fishing opportunities or permits that may be available. For some vessels with a high dependence on groundfish and few alternatives the DAS reductions could be sufficient to place these vessels at risk of business failure.

Given the lack of experience with DAS leasing the economic impacts are difficult to predict since the number of likely participating vessels is not known. The following analysis was prepared for the proposed DAS leasing program as part of the Emergency Action to extend FY2002 measures through April, 2004. While patterned after one of the DAS leasing alternatives developed by the Council, the particulars of that leasing program differ from the alternatives described herein. However, the analysis of economic impacts was conducted to gain an understanding of how DAS leasing program might perform in more of a general sense, so that analysis should still be relevant for consideration of DAS leasing under Amendment 13.

As noted previously, DAS leasing will provide small fishing entities with greater flexibility to adapt to the Amendment 13 regulatory framework. The following provide some insights as to how DAS leasing might affect individual vessels. However, DAS leasing could have broader seafood market implications as DAS are moved from one fishing platform to another. For example, there could be changes in the mix of species available to seafood buyers and distributors. Another possibility is that there could be regional changes in seafood supplies. Although, the aggregate supply of groundfish is not expected to differ, changes in the distribution of landings could result in increases in supply in one port while supplies in other ports may decline.

Based on an analysis of vessel break-even DAS requirements (for a full description see section 5.4.5) assuming that all vessels were to make a minimum crew share payment of $25,000 per person there would be 268 vessels that would be able to cover overhead costs but would not have enough DAS to make this minimum labor payment. The remaining 278 vessels would have more enough DAS to cover all overhead and crew costs. The total number of excess DAS for these vessels was 11,935 and the total number of DAS that would be needed to bring all other vessels up to a break-even level would be 11,080. At this relatively low crew payment, DAS leasing could make it possible for vessels to redistribute DAS so that all vessels could operate at or above break-even. Note that even in this situation no payments would be available for owner profits. Assuming an average crew payment of $35,000 or $50,000 per person even with a leasing program, there would not be enough DAS available to lease (among the vessels that rely on groundfish for 50% or more of total gross revenue) to allow all vessels to break-even. To obtain more DAS this pool of vessels would need to lease DAS from vessels with lower dependence on groundfish.

The break-even analysis was based on the minimum DAS necessary to cover all annual costs on groundfish trips alone and was based on average values derived from survey data. An alternative way of examining potential supply and demand for DAS leasing is to simply compare observed DAS use to DAS allocations. For this analysis, DAS used during FY2001 were compared to DAS allocations resulting from the Settlement Agreement. A total of 1,014 vessels used DAS in FY2001. Of these vessels, 614 used more DAS in that year than they were allocated for FY2002-2003. These vessels would need to be able to lease a total of 13,412 DAS in order for them to fish as many DAS as they did in FY2001. Total DAS that might be available from the 400 vessels that used fewer DAS than they were allocated are 10,010 DAS. Thus, the potential demand for DAS would exceed the potential supply by 3,402 DAS. With a larger DAS reduction this deficit would increase.

A Simulated DAS Leasing Market

In order to estimate the possible economic effects of a DAS leasing program, mathematical programming models were used to simulate a leasing market which might emerge given constraints placed on individual vessels. The model maximized industry profits by choosing the days each vessel will fish (if any) of their own allocation, days they will lease from other vessels, and the number of their days they will lease to other vessels. Each vessel can only fish a maximum number of days at sea, which is the sum of their Category A DAS and their FY 2001 allocation. Days fished above their allocation of Category A DAS must be leased from other vessels. Vessels were also not allowed to be both a lessee and lessor, although in reality this could happen. Restrictions were placed on the model that did not allow days to be leased by larger vessels from smaller vessels, which were consistent with the restrictions passed by the Council. Results from the model yielded a very efficient outcome in terms of maximizing industry profit with as few vessels as possible. In reality, the actual leasing of quota among industry participants may not be as profitable as projected by the model. An individual vessel's activity level[5] chosen by the model is determined by its productivity, the maximum allowable days it can fish, the lease price for days at sea, daily fishing costs, and the prices of each species, and a restriction which prohibit leasing of days from

[5] When vessels lease days from vessels of lower horsepower class, each day at sea is reduced by an adjustment factor. If the adjustment factor is 0.9 for example, 1 leased day will only be able to be fished 0.9 days.

smaller vessels by bigger vessels. The model does not differentiate between areas fished, where vessels land their fish, and a variety of other factors that will influence the amount of quota leased, including other fisheries in which the vessel can participate, and it assumes perfect information among participants.. The model also assumes perfect information for all permit holders, no transaction costs, and instantaneous transfers. None of these three conditions is likely to be present in a real leasing market place. While the model does not represent an actual leasing market, it does show the optimum level of leasing activity that could occur under perfect conditions and also identifies how DAS are likely to flow between vessels.

Vessels were grouped together regardless of gear type, and then stratified into fleets of 100 vessels[6]. Each fleet was then paired with itself, and then with every other fleet to simulate trades between all 1,345 vessels that could potentially lease quota. For each sector pair, the model was run fifty times in order to incorporate a stochastic lease price, which was generated based on results from a previous linear programming model. Lease prices used in the model ranged from $218 to $2,093, with a mean of $1,029. Results from the simulations were used to examine changes in profitability that would occur from allowing days at sea leasing.

Results

Results from the simulation runs were stratified by gear type and length of vessel. Class 1 vessels were less than 50 feet; class 2 vessels were between 50 and 69 feet, and class 3 vessels were 70 feet and greater. The three gear types examined were hook (50 vessels), trawl (1,126 vessels) and gillnet (169 vessels). There were more vessels in the model than had Category A DAS in the proposed action. Because vessels can fish up to the total of their Category A DAS and their FY 2001 allocation, vessels with zero Category A DAS can still lease days at sea, and therefore need to be included in the model. Because the model is attempting to maximize industry profit, under a DAS sea leasing scheme, fewer vessels will fish (Table 378). However, mean profits for all vessels will be higher than if days at sea trading were not allowed, and all vessels fished their allocation (Table 379). Mean profits are also higher than the mean profit levels generated during calendar year 2002 by vessels actually fishing.

Vessels which choose to lease all their quota can greatly enhance their profit since the owner is getting all the revenue from the lease without incurring any costs, and in particular not having to pay labor costs. The decision from a vessel perspective on whether to lease quota *to* other vessels is based on whether they can lease their quota for more then they would earn after paying crew share and covering other expenses[7]. If a vessel decides to lease quota *from* other vessels, it is based on whether they can earn more from a leased day at sea than what they will pay for the lease plus what they will pay to the crew, and to cover other expenses.

Model results generally showed the flow of lease days going from larger vessels to smaller vessels. Trawl and Gillnet vessels less than 50 feet in length were projected to use more days at sea than in 2002 under a DAS leasing scheme (Table 380). Trawl and Gillnet Vessels greater than 50 feet saw their days at sea

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[6] The size of the non-linear programming model limited the maximum fleet size which could be analyzed, while incorporating a stochastic lease price.

[7] The particular costs faced by each vessel depend on the particular lay system they employ. For the purposes of this model, it was assumed the vessel paid the variable operating costs such as fuel and ice, and then paid the crew. This simplified the model slightly, but may underestimate the profit that each vessel owner would earn under a days at sea leasing program if they decide to fish.

usage decline from 2002 levels. Hook vessels were also projected to see their days at sea increase. Restrictions on DAS trading make it difficult for larger vessels to lease from smaller vessels, but the opposite does not hold. Small vessels have a large potential number of vessels that they can lease from, which is what model results show. Examination of both tables 2 and 3 show that larger vessels can profit by leasing their days to smaller vessels. For example, length class 2 trawl vessels average profit was $68,387 using an average of 36.92 days of effort under a DAS leasing scheme, while their average profit was $31,428 using 46.13 days of effort in 2002. Small trawl vessels average profit was $41,111 using 31.9 days of effort under days at sea leasing, while their 2002 average profit was $12,271, and their average days at sea was 25.13. This demonstrates that both sectors would be better off with a DAS leasing program than fishing at their calendar year 2002 effort levels.

Additionally, the average profit levels were projected to be higher under days at sea leasing than if the vessels fished at their allocated 2004 levels. This demonstrates days at sea leasing provides substantial regulatory relief to vessels compared with no leasing.

		Vessels	Fishing
		with	Under
	Length	2004	DAS
Gear Sector	Class	Days	Leasing
Hook	ALL	41	30
Trawl	1	300	141
	2	211	97
	3	203	100
Gillnet	1	127	110
	2	18	10
Total		900	488

Table 304 - Number of Vessel Fishing in 2002 and Number Fishing with Days at Sea Leasing

			Profit (Mean Per Vessel)		
	Length			2004	2002
Gear Sector	Class	Vessels	Leasing	Allocation	Effort
Hook	ALL	50	78,700	39,806	24,247
Trawl	1	603	41,111	16,383	12,271
	2	266	68,387	30,102	31,428
	3	257	97,050	56,700	74,890
Gillnet	1	148	82,320	54,047	38,514
	2	21	74,644	46,945	53,465

Table 305 - Mean Profit per Vessel under Days at Sea Leasing

			Days Fished			
	Length					2002
Gear Sector	Class	Vessels	Leasing	Total	Sell	Effort
Hook	ALL	50	37.0	59.0	15.0	28.0
Trawl	1	603	19.28	31.91	19.30	25.13
	2	266	22.09	36.92	30.48	46.13
	3	257	21.52	46.26	34.92	70.00
Gillnet	1	148	42.79	70.89	18.44	33.07
	2	21	32.98	54.25	34.09	61.63

Table 306 - Average Days Fished and Leased by Gear Type and Length Class

5.4.9.2.8 Recreational Fishing Permit

The proposed action does not adopt a recreational fishing permit. Depending upon whether a fee to obtain a recreational fishing permit is collected, the requirement for a recreational fishing permit will impose few costs on fishermen, but could result in increased costs to administer the management plan. The requirement could be implemented through a web-based application. For example, a recreational fisherman could fill out a web-based form and immediately print out a permit, minimizing administrative costs to the government and simplifying the permitting process. There will still be a requirement to establish and maintain the web site and recreational permit database. Total costs will be directly the result of the number of persons that request a permit.

5.4.9.2.9 "Running Clock" Alternatives

The proposed action does not modify the "running clock" regulations. The "Running Clock" alternatives would have varying levels of economic impact. Option 1 would not add any new economic benefits or costs. However, in the Environmental Assessment of the Settlement Agreement Between Parties the modified "running clock" was shown to reduce potential trip income by almost 50% for trips taken in the Gulf of Maine. Option 2 would increase monitoring costs that would have to be borne by industry. The actual amount of these costs is not known, however, so it is not known whether the potential gains from a weighmaster program would offset these costs. Option 3 would provide an economic benefit as the amount of overages that would be allowed to be retained would increase.

The realized economic benefits of a "running clock" are not altogether clear at the level of DAS allocations contemplated in this Amendment. The opportunity cost of running DAS off the clock while tied to the dock may be quite high. However, for vessels and gears that target cod, the "running clock" may still be used to increase efficiency. For example, a vessel that is able to retain 2 days-worth of cod but incur only one days-worth of costs would realize higher profit than if forced to fish two days for the same amount of cod. The potential economic advantage of running the clock may actually increase in the event that an alternative with a hard TAC is selected. Depending on how a hard TAC is administered, running the clock while the trip limit is relatively high may be worth the DAS cost if the vessel anticipates that the fishery will shut down or will be subject to much more restrictive trip limits once the TAC has been reached.

5.4.9.2.10 Observer Coverage

At present, observer coverage is funded by NMFS and carrying an observer does not impose direct costs on fishing vessels. Any increase in the number of observers will increase directs costs for NMFS and also will impose additional administrative burdens. There is some inconvenience to carrying observers. There is also a requirement that vessels meet certain safety standards in order to carry an observer, which may increase costs for fishing vessels.

5.4.9.2.11 VMS Requirements

At present, vessels using VMS must send position information throughout the year, unless the vessel is hauled out. This option would allow a vessel owner to declare out of the fishery for a fixed length of time and suspend VMS operations. Because vessels pay for VMS transmission costs, this option would reduce vessel operating costs. Current messaging costs are as high as $3 per day (see section 5.4.9.2.14). Since all vessels fish for less than 200 days per year, the potential savings exceed $500 annually per vessel. Another possible benefit is that removing this requirement may encourage more vessel operators to purchase and use VMS.

5.4.9.2.12 Day Gillnet Block Out of the Fishery

The proposed action does not change these requirements and will impose no added economic benefit or cost. Removing the requirement to take time out of the fishery may improve day boat gillnet vessel's ability to make trip planning decisions. Although removing the blocks-out requirement is not likely to have a large economic benefit to day gillnet vessels it would provide some ability to improve overall business efficiency.

5.4.9.2.13 DAS Counting

The proposed action does not change the was DAS are counted. Changes to the way DAS are counted could result in substantial economic impacts. Any changes to the way DAS are counted would affect much of the analysis in this amendment. The closed area model – the foundation for the biological and economic impacts analysis – is based on existing DAS counting. Revisions to the counting of DAS would necessitate a major revision to the model and would result in completely revised impacts analysis. Given the three options for counting DAS, the different rebuilding strategies, and the number of other management alternatives proposed, it is not possible to run the closed area model for every combination of DAS counting and other alternatives.

In general, any changes to the way DAS are counted will have negative economic impacts on all vessels, but the impacts will vary in part based on a vessel's normal fishing practice. Establishing a minimum number of hours for each trip will affect vessels that make day trips the most. These vessels, which can use partial DAS, will be charged a full DAS for every trip they make. One possible response is for vessels to fish the full minimum period. For vessels that make partial day trips with minimum crews, this could cause safety concerns as fatigue increases. Vessels that make longer trips may be affected, but only on the first or last day of a trip (the only partial days fished). These vessels may be able to adjust their departure and arrival time to minimize the impacts of any change.

In addition, changing the way DAS are counted would raise the issue of whether DAS allocations should be re-calculated. The alternatives in this Amendment that reduce DAS are based on the current methods for counting those DAS. If DAS counting is changed, the DAS for each alternative should be recalculated in order to achieve the targeted mortality reduction. If that is not done, the DAS reductions proposed may result in excessive mortality reductions that will prevent attaining optimum yield.

5.4.9.2.14 Reporting Requirements

Dealer Reporting Requirements

Option 1 No Action
This option was not selected. The No Action option would not change any aspects of the current mandatory dealer reporting system. If this alternative is selected there would be no economic impacts on dealers. This does not necessarily mean that maintaining the status quo is not without cost since many aspects of the management support system including monitoring of target TACs, annual reviews by monitoring committees, stock assessments, and economic and social impact assessments rely on the a combination of dealer and vessel reporting. These transactions costs could be reduced by improving the timeliness of reporting and establishing a clear link between dealer and vessel reporting. Note that because of these two issues the No Action alternative would not be a viable alternative if a hard TAC alternative is selected.

Option 2 Trip Identifier Reporting
This option was not selected. Selection of Option 2 would change the dealer reporting requirements by adding two data elements. Adding the data elements would increase reporting burden but probably add little to dealer operating costs. Of the two data elements, the intended disposition of purchases would be less burdensome because the likely product use is probably known at the point of sale. While reporting the trip identifier would be comparatively more burdensome the responsibility for providing the trip identifier would be on the vessel so the dealer would be relieved from the cost of obtaining a unique identifier for the transaction.

The economic benefits of election of Option 2 would accrue in quality of information available to fishery managers. The trip identifier would resolve one of the primary difficulties encountered in monitoring, evaluation, and assessment of fishery performance. However, as was the case for Option 1, Option 2 would not be feasible if a hard TAC alternative is selected because paper reporting takes too long to process to permit real-time monitoring of TACs.

Option 3 Daily Electronic Dealer Reporting
This is the proposed action. Like Option 2, Option 3 would include two new data elements and would replace the paper report with daily electronic reporting. As noted above, adding the trip identifier and the disposition of the species purchased would not likely increase dealer costs. However, daily electronic reporting may require the purchase of or have access to equipment necessary to make electronic reporting possible, installation of new software, and may require subscription to an internet service provider. Most dealers are likely to at least have a computer with a modem and internet capability. Depending on the number of transactions that would need to be reported a web-based system may be cumbersome without subscription to a DSL or broadband service. A web-based system would probably not require installation of any specific software but would require compatibility with a chosen browser. A file transfer system may require installation of specific software to assure compatibility between both the sender (dealer) and receiver (NMFS).

The requirement for daily reporting would mean that dealers would have to make sure that someone is available every day to actually code and transmit all transactions. For some dealers that may manage current reporting requirements with part-time staff may need adjust work schedules or hire staff on a full-time basis.

Option 4 Daily Electronic Dealer Reporting With Exemption for Small Dealers
This option was not selected. Selection of Option 4 would not change the economic impact of daily electronic reporting for vessels that would not be exempted under this option . For years for which

complete data are available (Fishing years 1999 to 2001) approximately 60% of dealers issued a permit have reported no purchases of any of the 10 regulated large mesh species and about 22% purchased more than 5,000 pounds over an entire fishing year. Thus, Option 4 would exempt about 45% of dealers that purchase regulated groundfish.

Vessel Reporting Requirements

Option 1 No Action
This option was not selected. Taking no action would result in no added costs to vessels that are currently subject to mandatory reporting. However, as noted previously, no action would continue to be a barrier to more effective monitoring and assessment of stock status as well as the effectiveness of any given regulatory regime. This action would not be feasible if a hard TAC option is selected.

Option 2 Trip Identifier Reporting
This option is the proposed action. Selection of Option 2 would not change the timing of reporting but would add one data element to the VTR. Specifically, a trip identifier would need to be included with each trip report. The method for generating this identifier has yet to be determined but it would likely be generated through a mechanism that (a call-in confirmation or a VTR serial number) that would essentially be provided to each vessel. Vessels would still be required to report this number to each dealer. In cases where vessels sell to multiple dealers this trip identifier would have to be reported for every separate transaction. Note that this option would not be viable should a hard TAC option be selected.

Option 3 VMS Reporting for all Limited Access Multispecies DAS Vessels
This option was not selected. Selection of this option would place a VMS unit on every multispecies vessel with a DAS allocation. The cost of acquiring VMS units for the entire groundfish fleet subject to this requirement was estimated to be $4.3 million. This would be a one-time acquisition though and the longer term impact on vessel operating costs would be associated with the subscription cost of operating the VMS unit itself. Note that VMS requirements are included in several management options (area management, special access programs, and EFH) so these VMS costs would not necessarily be wholly assignable to VMS reporting. That is, if VMS is required to be on, then reporting through VMS would not add any increased operational costs but it would require that the Captain take the time to report all landings within a statistical area upon exiting or upon trip completion if fishing was conducted entirely within a single statistical area.

In addition to the VMS requirement, this Option would still require submission of a paper log that would include a trip identifier to be reported to each dealer. This option would also require that all non-DAS vessels that catch regulated groundfish (Category C limited access vessels and open access vessels) to report catches through a separate call-in system. Unlike DAS vessels these vessels would not be required to report in real-time if they fish in more than one statistical area. Instead, landings by statistical area would be reported upon completion of a fishing trip. Vessels exempted from VMS requirement would not be required to purchase any specific equipment or subscribe to any particular service and so would not bear any increase in business cost beyond that which would be associated with the time required to complete the phone call.

Option 4 VMS Reporting for Limited Access Multispecies Vessels Greater Than 45 Feet
This option was not selected. Selecting this option would differ from Option 3 only the respect that it would exempt more vessels from the VMS requirement. Exempted vessels would be required to report

through a call-in system described above. Based on permit application data for fishing year 2002, about 55% of all permitted vessels with multispecies DAS would be exempted from the VMS requirement under Option 4. This means that the fleet-wide acquisition cost would be reduced from $4.5 million to $2.0 million and annual operating costs would be reduced from $73 thousand to $33 thousand. Note that these exempted vessels would still be required to report landings upon trip completion via the proposed phone system.

Option 5 Declaration into One Fishing Area
This option was not selected. Option 5 would provide a different way of providing vessels with flexibility to select a reporting procedure other than uniform adoption of VMS. Option 4 provides flexibility but only based on a vessel's overall length. This option provides flexibility based largely on an individual's fishing practice and not a single physical characteristic. Specifically, vessels that choose not to purchase a VMS system would be able to obtain a Letter of Authorization that would require that the vessel fish exclusively in a single statistical area for a minimum of 30 days. Vessels that chose to obtain an LOA would also be exempted from having to report landings through the proposed phone system since all landings would still be reported via daily dealer reports. Statistical area information would not need to be reported since all landings would be automatically assigned to the single area listed in the LOA.

Option 5 may offer only limited flexibility since any participating vessel would lose the flexibility to fish in multiple statistical areas on a trip-by-trip basis. Thus, vessels would be faced with a trade-off between reduced VMS costs but less choice in terms of area fished. Some components of the groundfish fleet do fish exclusively within a single statistical area for the entire groundfish landings while others may fish in several different statistical areas but may do so on a seasonal basis. Vessels that fish in this manner may elect to obtain an LOA based on this seasonal pattern.

Option 6 Call-In System Modification
This option was not selected. Selection of Option 6 would not require VMS but would change the information reported when a vessel calls to terminate a DAS trip. This option would not increase the number of times vessels would be required to call-in but would increase the amount of time required to complete the call. Vessels that are not currently subject to DAS controls (hence no call-in requirement) would be required to participate in the call-in system.

Option 7 Various Electronic Reporting for All Vessels
This option was not selected, but the proposed action is very similar. Once operational, an electronic reporting system for vessels would be made available to vessels. Vessels that adopt this technology would be relived from the responsibility of submitting a paper logbook but may be required to purchase any hardware and software that may be needed. Since this would be voluntary, any vessel that does so may be presumed to gain some advantage from its participation.

VMS Considerations

To cover the entire fishing fleet of 1484 vessels, at $2900 per unit including the PC, would cost $4.3 million initially, or less than 1% of the ex-vessel value of New England fisheries ($681 million in 2000). Although fishing effort is reduced to half the 73,063 DAS allocated, it is expected that the vessels will place those days-at sea (one-for-one) in other fisheries, in order to stay in business. With 73,063 days-at-sea (with the VMS shut off while the vessel is tied to the dock) adds $73 thousand per year. Double-pinging to protect closed areas or participate in exempted fisheries add $70 thousand annually. Safety may be enhanced by including distress buttons on each unit, and costs $1.6 million for the 1484 boats and vessels, but this is not a requirement for groundfish management.

However, the benefits of total fleet coverage, especially to a multispecies fishery like that managed by the groundfish FMP, are much greater than tallying the official DAS and protecting the large, fixed closed areas. If all vessels require VMS, even partial closed areas become somewhat more inviolate because the enforcement agencies can identify every boat that enters them at any time. Likewise, corroboration of other reporting will be comprehensive rather than piecemeal, as it is with less than full VMS coverage. Safety at sea coverage will be comprehensive, and the extra $1100 per unit for this purpose adds only $1.6 million, to protect nearly 1500 U.S. vessels at sea. Any requirements for sampling at sea will be greatly enhanced with full VMS coverage, because the density of fishing vessel activity in the various fish stock areas will be known. Observer and Homeland Security programs will be enhanced, in similar fashion. Finally, trip limits, gear restrictions, fish sizes and other management measures may be affected.

Optionally, to cover that portion of the fishing fleet that has over 10 DAS allocated will eliminate VMS costs on vessels minimally involved in the multi-species fishery. These 1083 vessels, at $2900 per unit including the PC, would cost $3.1 million initially. Their 72,473 days-at-sea (with the VMS shut off while the vessel is tied to the dock) add $72 thousand per year. Double-pinging to protect closed areas or participate in exempted fisheries add $69 thousand annually. Additionally, safety would be enhanced by including distress buttons on each unit, and costs $1.1 million for the 1083 boats and vessels.

Finally, to cover that portion of the fishing fleet that has over 20 DAS allocated will eliminate VMS costs on even more vessels involved in the multi-species fishery. These 988 vessels, at $2900 per unit including the PC, would cost $2.8 million initially. Their 71,074 days-at-sea (with the VMS shut off while the vessel is tied to the dock) add $71 thousand per year. Double-pinging to protect closed areas or participate in exempted fisheries add $68 thousand annually. Additionally, safety could be enhanced with distress buttons on each unit, and costs $1.1 million for the 988 boats and vessels.

The benefits of such programs are reduced, somewhat, from those attainable with total VMS coverage, particularly the enforcement effectiveness on secondary measures like partial closures and trip limits. The costs are reduced fleet-wide, but are the same for each vessel in the program. The downside for vessels in the program is that, although they pay the same cost, the effectiveness and thus the benefits of management are reduced proportionate to the percent of the fleet with mandatory VMS. The incentive, however, is that mandatory-VMS vessels may participate in exempted fisheries in the closed areas.

Device	Boatracs	Thrane & Thrane 3022D	Thrane & Thrane 3026M	Comments:
Cost	$6,000	$2,650	$*1,550*	Inmarsat has *no* service connection fee
Communication (flat fee; add'l amount above some limit)	$3/day two-way	$1/day two-way (requires PC)	$1/day two-way (requires PC)	e.g. Thrane & Thrane sells a terminal for $1,350
Distress buttons	Yes	Yes	No	
Delay	5-10 minutes	5-10 minutes	5-10 minutes	No transmit, no cost with Inmarsat
Maintenance	Replacement parts available	2 year warranty	2 year warranty	

Table 307 - Comparison of VMS Vendors

Note: Trimble is dropped from consideration; they no longer provide Inmarsat based units. Likewise, Argos is dropped because it is only approved for use in Alaska.

Option: (boats)	Initial Cost ($1550 plus $1350 PC per boat)	Communication Cost ($1 per DAS)	Pinging Cost* (24/DAS)	Safety ($1,100 per boat)
Alternative 1 (1484)	$4,303,600	$73,063	$70,140	$1,632,400
Over 10 DAS (1083)	$3,140,700	$72,473	$69,574	$1,191,300
Over 20 DAS (988)	$2,865,200	$71,074	$68,231	$1,086,800
Alternative 2	None	n.a.	n.a.	n.a.
Alternative 3 (76 2-areas + 116 GB yellowtail)	$556,800	Unk.	Unk.	$211,200
Alternative 4				
Area options 1-4,6 (152 or 20%)	$440,800	Unk.	Unk.	$167,200
Area option 5 (762 or 80%0	$2,209,800	Unk.	Unk.	$838,200
Alternative 5	None	n.a.	n.a.	n.a.
Alternative 6	None	n.a.	n.a.	n.a.
Alternative 7 (33 longlines + 62 gillnets)	$275,500	Unk.	Unk.	$104,500
Alternative 8				
Option 1 (1484)	$4,303,600	$73,063	$70,140	$1,632,400
Option 2 & 3	None	n.a.	n.a.	n.a.

Table 308 - Cost of VMS Across Rebuilding Alternatives

Note: currently, NE OLE pays all costs associated with the advisory email messaging and extra positioning costs when a vessel enters a closed area; monthly charges average $1,500.

** Boatracs cost 7 cents per ping, or $1.68 per DAS for 24 pings; Inmarsat, 4 cents, or $0.96. Pinging costs are shown using Inmarsat.*

5.4.9.2.15 Hand Gear-Only Permit Alternatives

Preliminary Assessment of Qualification

A preliminary assessment of numbers of potential qualifiers by hand-gear only permit category was conducted using VTR data for fishing years 1997-2000. The VTR data were used instead of dealer data because dealer records from both Connecticut and Delaware do not identify unique vessels. Fishing year 2001 was not included in the analysis because VTR records are not yet complete. The total number of open access hand-gear only permits has increased by about 150 permits in each year from 1998-2000 (Table 309). Of these permits, 10 to 11 percent reported landings of either cod, haddock, or pollock

(CHP) in any given fishing year. Of the vessels that did report landing of CHP at least 65% did not report landings in excess of 500 pounds for the entire fishing year.

	1997	1998	1999	2000
Number of Open Access hand Gear Permits	1,392	1,330	1,471	1,637
Number of Permit Holders Reporting Cod/Haddock/Pollock	151	151	151	184
Number of Permit Holders Landing >= 500, < 1000 lbs C/H/P (Category A)	47	48	42	65
Combined Landings Category A	105,210	172,159	123,974	165,465
Combined Landings Category B	15,685	37,042	12,227	16,786

Table 309 - Open Access Hand-Gear Permit Category Activity (Fishing Years 1997-2000 VTR)
Note: landings in pounds

The total number of vessels that landed 1,000 pounds or more of CHP was 79 while 61 vessels landed at least 500 but less than 1,000 pounds in any one of the four fishing years used for analysis (Table 309). The former would qualify for a Category A permit while the latter would qualify for a Category B permit. Based on permit data for fishing year 2001, 23 of these Category A qualifiers and 19 Category B qualifiers did not hold an open access hand-gear only permit in fishing year 2001. The majority of potential Category A (44) or B (25) permit holders reported a Massachusetts port as their permit application for FY2001.

	Category A	Category B	Total Vessels
Connecticut	2	35	37
Delaware	0	6	6
Massachusetts	69	781	850
Maryland	0	9	9
Maine	1	307	308
North Carolina	0	18	18
Other	0	12	12
New Hampshire	10	96	106
New Jersey	0	130	130
New York	9	168	177
Rhode Island	7	110	117
Virginia	0	42	42
No FY 2001 Permit	42	0	42
Total	140	1,714	1,854

Table 310 - Number of FY2001 Permit Holder Qualifiers by State (Principal State)
Note: landings in pounds

Alternative 1 would not change any economic benefits or costs relative to current regulations. However, in the Environmental Assessment of the Settlement Agreement Between Parties vessels holding these permits were estimated to lose an average of 2% of total fishing revenues and 5.8% of groundfish revenue. Alternative 2 would not change the trip limits but would remove the prohibition of issuing permits to vessels that had never held any such permit. Alternative 2 would have no additional economic impact on vessels that may participate in the fishery but would provide, albeit limited, an opportunity for new participants.

The proposed action, Alternative 3 would convert the hand-gear only permit category into a two-level limited access hand-gear only permit and an open access category. Regardless of permit qualification, economic opportunities for both haddock and yellowtail flounder but would improve compared to Alternatives 1 and 2. Vessels that qualify for the highest limited access category (Category A) would see improved economic opportunities as the cod trip limit would be higher than under Alternatives 1 or 2. However, VTR reports for roughly half of these vessels suggest that even the lower trip limit would have minimal economic impact as they had few, if any, occasions where the cod trip limit would have been exceeded. Even so, some of these Category A vessels may still be able to increase overall fishing income if they can increase catches of haddock or other groundfish species.

The proposed action retains the open access hand-gear only permit but would set the cod trip limit at 75 pounds rather than 200 pounds under Alternative 1 or Alternative 2. In terms of potential impact this would appear to provide for reduced economic opportunities relative to Alternative 1 or 2. However, only about 10% of vessels holding an open access hand-gear only have actually reported landing groundfish in any given year. Vessels that had relied on groundfish to any substantial degree would be more than likely to qualify for one of the limited access permit categories. Therefore, the lower trip limit assigned to the Category B may have relatively little realized economic impact on current permit holders. In the longer term, however, new participants would find their income potential constrained by the Category B cod trip limit as compared to Alternative 2. Note that compared to Alternative 1 where they would not be able to obtain a permit, new participants would still be better off under Alternative 3.

5.4.9.3 Sector Allocation

By creating a process for the formation of self-selecting sectors, this Amendment creates an opportunity for groups of vessels to adapt their fishing behavior so that they remain economically viable in the face of increasing restrictions imposed to rebuild groundfish stocks. The ability to form a sector could be an important component of providing flexibility to small commercial fishing entities to mitigate the economic impacts of the Amendment. Further, depending on the geographic location of the membership of a given sector, sector allocation could also provide an opportunity for fishing communities to reduce economic impacts.

5.4.9.3.1 GB Hook/Gillnet Sector

The creation of a voluntary sector for longline/hook and gillnet vessels on Georges Bank provides an opportunity for vessels to mitigate the impacts of the management alternatives. By organizing into a cooperative, vessels may be able to develop more efficient ways to harvest groundfish and minimize the inefficiencies that result from the regulations.

While it is not possible to estimate the economic impacts of a sector until the actual participants are known, the pool of participants will probably be the vessels that have used longline or gillnet gear to fish on GB in the past. For fishing years 1996 through 2000, 182 vessels reported using longline gear to catch GB cod, and 294 vessels reported using gillnet gear. Some vessels used both gear – these two numbers represent 488 individual vessels. For fishing year 2001, there were 85 gillnet vessels in the GB cod fishery and 32 vessels that used hook gear. Gillnet vessels landed 14 percent of the GB cod in fishing year 2001, and hook vessels landed 10 percent of the GB cod (see Appendix VI). Gillnet vessels harvested 19 percent of the GB cod landed in fishing year 2000, while hook vessels harvested 9 percent (see MSMC 2001). About 86 percent of the GB cod landed from 1996 though 2000 by these two gears was landed in Chathem/Harwichport, MA, suggesting that this community is the one most likely to benefit if vessels choose to participate in this sector. Another 10 percent of GB cod was landed in Gloucester, MA by these two gear types.

This alternative also includes access to CAI to harvest haddock. From 1996 through 2000, 44 hook vessels and 71 gillnet vessels reported landing GB haddock, roughly one-fourth of the total number that reported landing GB cod. Allowing access to CAI for vessels that choose to participate in the sector may increase the ability of these vessels to target GB haddock, further mitigating the impacts of the rebuilding programs.

Depending upon the selected management alternative a sector allocation for this particular sector could be the difference between financial viability and business failure. Alternative 2 would reduce the Georges Bank cod trip limit from 2,000 to 500 pounds per day. The economic analysis of this alternative indicates that this change would have a disproportional impact on hook and gillnet vessels that depend on Georges Bank cod in general and on vessels with a home port of Chatham/Harwich in particular. Thus, relative to other gear sectors in other ports, the proposed Georges Bank Hook/Gillnet Sector Allocation may be an important component in regulatory design to offer small entity flexibility in the Chatham/Harwich fishing community.

VMS Considerations

VMS is required for both the 33 vessels in the longline sector and the 62 vessels in the gillnet sector. These 95 vessels, at $2900 per unit including the PC, would cost $275 thousand initially for VMS units. Their days-at-sea are unknown, thus communications and double-pinging costs are unknown as well. Safety could be enhanced with distress buttons on each unit, with an additional $104 thousand.

5.4.9.4 Economic Impacts of Measures to Control Capacity

Each of the capacity alternatives is designed to provide greater economic opportunity and flexibility in all fisheries while maintaining the character of the existing fleet and to achieve some long-term reduction in the number of vessels permitted to fish in Northeast fisheries. Many of these alternatives require that with the transfer of its permits the selling vessel must retire from fishing in state or federal open and limited access fisheries. While this expands economic opportunities for some vessels, it eliminates participation of others in the groundfish and other fisheries. This may reduce participation in the capacity reduction programs. Measures which define effective effort may have widely varied impacts on permit holders depending on their history in the groundfish fishery, benefiting some and severely limiting others.

5.4.9.4.1 Alternative 1 - DAS Absorption

This option was not selected.

Probable participants

The only permits that cannot be transferred or acquired under current regulations are limited access multispecies permits for scallop vessels or scallop limited access permits for multispecies limited access vessels. Under existing regulations, all other permits can be acquired and combined on vessels within the replacement and upgrading restrictions of the fisheries in question. As a result, only limited access multispecies and scallop permit holders would be affected by this alternative.

The permit holders most likely to give up or transfer their groundfish or scallop permits under this alternative are those who are likely to get a net economic benefit from doing so. This group probably would consist largely of either (1) permit holders who are not actively using a multispecies or scallop permit and therefore not realizing a current economic return on the permits or (2) permit holders/vessel operators who wish to retire from either fishery. Under this alternative, transactions between vessels that hold limited access scallop permits and vessels that hold limited access multispecies permits are assumed to be most likely.

There are the following practical constraints suggested by industry members that would limit participation under this alternative.

- Given the relative value of the fisheries, scallop vessels are more likely to buy groundfish permits than vice versa.
- It is expensive and difficult (sometimes not practical) for groundfish boats to re-rig to be able to tow large dredges.
- Allow vessels to diversify into other fisheries.

Impacts

To determine how this alternative may be utilized, a series of hypothetical permit exchanges between limited access scallop and limited access multispecies vessels was examined. Only vessels greater than 50 GRT were included in the analyses since the majority of limited-access scallop vessels are this size or greater. Separate data sets describing fishing activity of multispecies and scallop vessels were sorted by vessel length. Multispecies and scallop vessels were matched according to compatible vessel length.

Each data set contained information on all limited access permits assigned to vessels for permit year 2000. Active days were assumed to be based on time reported through either the call-in or VTR records. To retain consistency between this proposal and all others, the quantity of active days was estimated as the maximum days used (not to exceed current DAS allocations) from the call-in or days absent computed from the VTR on trips where regulated multispecies were landed from fishing years 1994 to 1999. A random sample of 100 vessels was taken from each data set. After sorting by vessel size, these data were merged. This process was repeated 25 times to develop a range estimate of the potential effects of the permit absorption proposal.

In a set of hypothetical exchanges between 100 scallop and 100 multispecies vessels, 212 limited access permits would be absorbed at the median. Given the three options for a transfer tax, the median multispecies DAS allocations would be reduced from 9,003 to

a) 8336 in Option 1a (0/20% tax)
b) 7769 in Option 1b (10/20% tax)
c) 6536 in Option 2 (20/40% tax)
d) 3668 in Option 3 (50/75% tax)

Given the three options for a transfer tax, the median scallop DAS allocations would be reduced from 10,476 to

a) 10,218 in Option 1a (0/20% tax)
b) 9299 in Option 1b (10/20% tax)
c) 8123 in Option 2 (20/40% tax)
d) 4916 in Option 3 (50/75% tax)

In addition to allowing all vessels to hold a groundfish and a scallop permit, the permit absorption proposal would result in nearly all vessels holding limited access dogfish, fluke, lobster, and monkfish permits. Most vessels would also possess a limited access black sea bass, scup, and loligo squid permit.

	Scallop Permit Holders			Groundfish Permit Holders			Absorbed Permits			Remaining Permits		
Permits	Min.	Med.	Max.	Min.	Med.	Max.	Min.	Med.	Max.	Min.	Med.	Max.
Black Sea Bass	34	41	52	24	30	42	5	11	16	53	62	71
Dogfish	88	91	95	77	83	90	70	76	82	95	99	100
Illex Squid	4	9	13	1	3	7	1	1	2	6	11	17
Loligo Squid	18	26	33	12	20	28	1	4	6	35	43	51
Lobster	57	66	75	65	75	80	42	50	58	83	92	96
Monkfish	54	62	69	22	33	41	19	25	31	63	70	77
Scup	32	40	47	30	37	44	5	13	17	55	65	78
Summer Flounder	84	89	92	29	39	47	25	32	39	86	94	98
Multispecies (A)				4	7	14				4	7	14
Multispecies (B)				71	75	82				71	75	82
Multispecies (C)				0	0	4				1	1	4
Multispecies (D)				5	11	16				5	11	16
Multispecies (E)				0	3	5				1	3	5
Multispecies (F)				0	0	1				1	1	1
Multispecies (G)				0	1	4				1	2	4
Scallop (2)	69	77	83							69	77	83
Scallop (3)	2	5	11							2	5	11
Scallop (4)	0	1	2							1	1	2
Scallop (5)	0	1	2							1	1	2
Scallop (6)	0	1	2							1	1	2
Scallop (7)	1	4	9							1	4	9
Scallop (8)	4	7	10							4	7	10
Scallop (9)	2	5	12							2	5	12

Table 311 - Summary of Limited Access Permit Holders, Permits Absorbed, and Remaining Permits for 100 Theoretical Vessel Transactions

	Minimum	Median	Maximum
Allocated Groundfish Days	8597	9003	9231
Allocated Scallop Days	9528	10476	11166
Active Groundfish Days	4665	5670	6355
Inactive Groundfish Days	3932	3333	2876
Active Scallop Days	7696	9186	10340
Inactive Scallop Days	1832	1290	826
Post-Absorption Groundfish Days	7811	8336	8656
Post-Absorption Scallop Days	9162	10218	11001
Reduced Groundfish Days	786	667	575
Reduced Scallop Days	366	258	165
Activated Groundfish Days			
Year 1	1562	1667	1731
Year 2	3124	3335	3462
Year 3	4686	5002	5193
Year 4	6248	6669	6925
Year 5	7811	8336	8656

Table 312 - Option 1a: 0% for Active DAS and 20% Tax for Inactive DAS. Summary of DAS Allocation Effects of Permit Absorption for 100 Vessel Transactions

	Minimum	Median	Maximum
Allocated Groundfish Days	8597	9003	9231
Allocated Scallop Days	9528	10476	11166
Active Groundfish Days	4665	5670	6355
Inactive Groundfish Days	3932	3333	2876
Active Scallop Days	7696	9186	10340
Inactive Scallop Days	1832	1290	826
Post-Absorption Groundfish Days	7344	7769	8020
Post-Absorption Scallop Days	8392	9299	9967
Reduced Groundfish Days	1253	1234	1211
Reduced Scallop Days	1136	1177	1199
Activated Groundfish Days			
Year 1	1469	1554	1604
Year 2	2938	3108	3208
Year 3	4406	4662	4812
Year 4	5875	6216	6416
Year 5	7344	7769	8020

Table 313 - Option 1b: 10% for Active DAS and 20% Tax for Inactive DAS. Summary of DAS Allocation Effects of Permit Absorption for 100 Vessel Transactions

	Minimum	Median	Maximum
Allocated Groundfish Days	8597	9003	9231
Allocated Scallop Days	9528	10476	11166
Active Groundfish Days	4665	5670	6355
Inactive Groundfish Days	3932	3333	2876
Active Scallop Days	7696	9186	10340
Inactive Scallop Days	1832	1290	826
Post-Absorption Groundfish Days	6091	6536	6810
Post-Absorption Scallop Days	7256	8123	8768
Reduced Groundfish Days	2506	2467	2421
Reduced Scallop Days	2272	2353	2398
Activated Groundfish Days			
Year 1	1218	1307	1362
Year 2	2436	2614	2724
Year 3	3655	3921	4086
Year 4	4873	5229	5448
Year 5	6091	6536	6810

Table 314 - Option 2: 20% for Active DAS and 40% Tax for Inactive DAS. Summary of DAS Allocation Effects of Permit Absorption for 100 Vessel Transactions.

	Minimum	Median	Maximum
Allocated Groundfish Days	8597	9003	9231
Allocated Scallop Days	9528	10476	11166
Active Groundfish Days	4665	5670	6355
Inactive Groundfish Days	3932	3333	2876
Active Scallop Days	7696	9186	10340
Inactive Scallop Days	1832	1290	826
Post-Absorption Groundfish Days	3316	3668	3896
Post-Absorption Scallop Days	4306	4916	5377
Reduced Groundfish Days	5281	5335	5335
Reduced Scallop Days	5222	5560	5789
Activated Groundfish Days			
Year 1	663	734	779
Year 2	1326	1467	1559
Year 3	1989	2201	2338
Year 4	2652	2935	3117
Year 5	3316	3668	3896

Table 315 - Option 3: 50% for Active DAS and 75% Tax for Inactive DAS. Summary of DAS Allocation Effects of Permit Absorption for 100 Vessel Transactions

5.4.9.4.2 Alternative 2 – Permit Transfer

This option was not selected.

Probable participants

This proposal would allow a multispecies vessel to transfer its limited access permits to more than one vessel. As a result, this proposal could interest the owners of many of the following vessels and permits:

- Inactive permits (either permits for which there are no existing vessels or permits for vessels not landing groundfish)
- Active scallop permit holders wishing to acquire a groundfish permit
- Active groundfish vessels wishing to acquire a scallop permit
- Other fishing vessels wishing to acquire a groundfish permit

The permit holders most likely to give up or transfer their groundfish or scallop permits under this proposal are those who are likely to realize an economic benefit from doing so. This group probably would consist largely of inactive permit holders because they are not realizing a current economic return on their permits or permit holders/vessel operators who wish to retire from a particular fishery.

Impacts

- Multispecies permits with associated DAS allocations that have not been fully used by their current permit holders could be transferred to other vessels. This affords vessels more flexibility in the use and transfer of their DAS allocations.

- Because this proposal does not allow DAS to be combined ("stacked"), the multispecies DAS would have to be acquired by vessels not already holding limited access multispecies permits. This would remove DAS from the multispecies fishery.
- Based on data in the *Analysis of Latent Fishing Effort in the Northeast Multispecies Fishery*, about 23,000 DAS were allocated to history permits (permits for which there are no existing vessels) or Category 1 permits (no fishing activity 1994-1998). Although this is an overestimate of the DAS allocations for history and Category 1 permits, it was used to approximate the total DAS that possibly could be transferred from these permits for the purpose of analysis. If all DAS are transferred, there will be a reduction of 4,600 unused (latent) DAS and a potential increase of 3,680 DAS per year (under a 20%/yr reactivation rate) up to a maximum of 18,400 after 5 years. If the 10%/yr activation rate option were used, there would be the same reduction of 4,600 unused DAS and potential increase of 1,840 DAS per year up to the 18,400 DAS maximum.

Permit transfer would allow vessel owners to sell individual limited access permits to other vessel owners. However, unlike the permit absorption proposal, the transferring vessel would not be able to obtain any fishing permits (state or federal) in the future. Individuals that may want to retire from fishing or individuals that own a vessel that has not been used in any fishing activity over the past several years may be most likely to take advantage of the permit transfer proposal.

Although the actual number of owners that may be willing to permanently remove their vessel from all state and Federal fisheries is not known, it may be assumed that vessels that have not been actively fishing over some period of time may be most likely to participate. For purposes of analysis, two scenarios were constructed. In the first scenario vessels that did not record any fishing activity either through dealer or VTR records in any year from 1994 to 1999 were assumed most likely to participate in a permit transfer program. The second scenario was constructed under the assumption that all limited access multispecies permit holders were equally likely to participate.

The analysis was conducted in a manner similar to that of the permit absorption alternative. Specifically, 100 vessels were randomly selected for each scenario. The limited access permits and DAS that would become available would then depend upon the mix of permits and DAS allocations of the selected vessels. Active DAS were estimated in the same manner as described for the Permit Absorption alternative (#1). A total of 25 replicates were performed to construct minimum, median, and maximum estimates of available permits and DAS that would become available for transfer.

Scenario 1
Under the assumption that less active vessels are the most probable participants in the permit transfer program, an additional 331 limited access permits are likely to participate. Given the three options for a transfer tax, the median DAS available for transfer would be reduced from 8,372 allocated DAS to:

a) 6994 in Option 1a (0/20% tax)
b) 6990 in Option 1b (10/20% tax)
c) 5248 in Option 2 (20/40% tax)
d) 2194 in Option 3 (50/75% tax)

Scenario 2
Under the more general assumption that all vessels are equally likely to participate, in addition to the 100 multispecies permits that would become available there would be 425 other limited access permits. Given

the three options for a transfer tax, the median DAS available for transfer would be reduced from 8,990 allocated DAS to:

a) 8293 in Option 1a (0/20% tax)
b) 7743 in Option 1b (10/20% tax)
c) 6945 in Option 2 (20/40% tax)
d) 3624 in Option 3 (50/75% tax)

	Scenario 1: Inactive Permits Only				Scenario 2: All Permits		
	Minimum	Median	Maximum		Minimum	Median	Maximum
Black Sea Bass	9	15	17		23	30	36
Dogfish	68	73	77		77	84	89
Illex Squid	0	1	1		0	3	7
Loligo Squid	7	10	12		14	19	26
Lobster	65	69	75		67	75	85
Monkfish	12	17	19		28	35	40
Scallop	1	3	4		1	4	6
Scup	17	22	27		28	38	43
Summer Flounder	16	21	24		26	37	45
Multispecies (A)	1	2	3		3	8	14
Multispecies (B)	72	77	82		66	77	83
Multispecies (C)	0	0	0		0	1	2
Multispecies (D)	11	15	19		5	11	18
Multispecies (E)	1	3	4		0	2	5
Multispecies (F)	0	0	0		0	0	1
Multispecies (G)	1	3	4		0	1	4

Table 316 – Summary of Permits Available for Transfer Under Permit Transfer Proposal for 100 Vessel Transactions

	Scenario 1: Inactive Permits Only			Scenario 2: All Permits		
	Minimum	Median	Maximum	Minimum	Median	Maximum
Allocated Days	8639	8732	8877	8697	8990	9272
Active Days	17	44	51	4930	5506	6234
Inactive Days	8622	8688	8826	3767	3484	3038
Transferred Days	6915	6994	7112	7944	8293	8664
Reduction in Days	1724	1738	1765	753	697	608
Activated Days						
Year 1	1383	1399	1422	1589	1659	1733
Year 2	2766	2798	2845	3177	3317	3466
Year 3	4149	4197	4267	4766	4976	5199
Year 4	5532	5596	5689	6355	6635	6932
Year 5	6915	6994	7112	7944	8293	8664

Table 317 - Option 1a: 0% for Active DAS and 20% Tax for Inactive DAS. Summary of Days at Sea Transferred Under Permit Transfer Proposal for 100 Vessel Transactions

	Scenario 1: Inactive Permits Only				Scenario 2: All Permits		
	Minimum	Median	Maximum		Minimum	Median	Maximum
Allocated Days	8639	8732	8877		8697	8990	9272
Active Days	17	44	51		4930	5506	6234
Inactive Days	8622	8688	8826		3767	3484	3038
Transferred Days	6913	6990	7107		7451	7743	8041
Reduction in Days	1726	1742	1770		1246	1247	1231
Activated Days							
Year 1	1383	1398	1421		1490	1549	1608
Year 2	2765	2796	2843		2980	3097	3216
Year 3	4148	4194	4264		4470	4646	4825
Year 4	5530	5592	5685		5960	6194	6433
Year 5	6913	6990	7107		7451	7743	8041

Table 318 - Option 1b: 10% for Active DAS and 20% Tax for Inactive DAS. Summary of Days at Sea Transferred Under Permit Transfer Proposal for 100 Vessel Transactions

	Scenario 1: Inactive Permits Only				Scenario 2: All Permits		
	Minimum	Median	Maximum		Minimum	Median	Maximum
Allocated Days	8639	8732	8877		8697	8990	9272
Active Days	17	44	51		4930	5506	6234
Inactive Days	8622	8688	8826		3767	3484	3038
Transferred Days	5187	5248	5336		6204	6495	6810
Reduction in Days	3452	3484	3541		2493	2495	2462
Activated Days							
Year 1	1037	1050	1067		1241	1299	1362
Year 2	2075	2099	2135		2482	2598	2724
Year 3	3112	3149	3202		3722	3897	4086
Year 4	4149	4198	4269		4963	5196	5448
Year 5	5187	5248	5336		6204	6495	6810

Table 319 - Option 2: 20% for Active DAS and 40% Tax for Inactive DAS. Summary of Days at Sea Transferred Under Permit Transfer Proposal for 100 Vessel Transactions

	Scenario 1: Inactive Permits Only				Scenario 2: All Permits		
	Minimum	Median	Maximum		Minimum	Median	Maximum
Allocated Days	8639	8732	8877		8697	8990	9272
Active Days	17	44	51		4930	5506	6234
Inactive Days	8622	8688	8826		3767	3484	3038
Transferred Days	2164	2194	2232		3407	3624	3876
Reduction in Days	6475	6538	6645		5290	5366	5396
Activated Days							
Year 1	433	439	446		681	725	775
Year 2	866	878	893		1363	1450	1551
Year 3	1298	1316	1339		2044	2174	2326
Year 4	1731	1755	1786		2725	2899	3101
Year 5	2164	2194	2232		3407	3624	3876

Table 320 - Option 3: 50% for Active DAS and 75% Tax for Inactive DAS. Summary of Days at Sea Transferred Under Permit Transfer Proposal for 100 Vessel Transactions

5.4.9.4.3 Alternative 3 – DAS Transfer

This option is part of the proposed action.

Potential Participants

In this option, only limited access multispecies permit holders could acquire multispecies DAS from another multispecies permit holder. For the reasons stated earlier in the report, the most likely sellers are inactive or retiring multispecies permit holders and the most likely buyers are active multispecies permit holders who could use more DAS.

Impacts
Based on data in the *Analysis of Latent Fishing Effort in the Northeast Multispecies Fishery*, about 23,000 DAS were allocated to history permits or Category 1 permit holders. This amount overstates the number of DAS for these categories for the period 1994-1999 because it reflects DAS for vessels in these categories in any single year. However, it allows an estimate of the total potential DAS that could be transferred from these permits. If all DAS were transferred, there would be a reduction of about 20,700 unused (latent) DAS and a potential increase of 460 DAS per year (under a 20% reactivation rate) up to a maximum of 2,300 DAS after 5 years.

DAS transfer would allow vessels to sell DAS at differing rates depending upon activity from 1994 to 1999. The DAS transfer proposal was analyzed by constructing a data set containing permit information, current DAS allocations, vessel category, and active DAS for every limited access vessel except permit category C since these vessels are exempted from DAS controls. All permit information was based on permit year 2000. Similarly, DAS allocations were also based on the 2000 permit year. Vessel categories were equivalent to those described in the DAS transfer proposal. Data used in previous analysis of latency in Northeast multispecies for the Capacity Committee were used to designate vessel categories. Active DAS were estimated by summing DAS call-in and VTR data by year (1994 to 1999) and selecting the maximum DAS. Due to larger DAS allocation, active DAS exceeded current allocations prior to fishing year 1997 for some vessels. In these cases, active DAS were set equal to current allocations.

As was the case for permit absorption, it is difficult to predict the number of vessels and the circumstances under which vessels would be willing to buy or sell DAS. Given this uncertainty, two scenarios were constructed. In the first, a set of hypothetical exchanges between selling and buying vessels were selected at random from all limited access permit holders. For this scenario, randomly selecting 100 sellers and matching these sellers with 100 randomly selected buyers modeled a total of 100 simulated exchanges. Buyers and sellers were sorted by vessel length to assure that all simulated exchanges took place among vessels that would be within (or approximately so) the upgrade restrictions. In the second scenario, it was assumed that vessels that would be most likely to sell DAS would be individuals that may want to retire from fishing or may not intend to continue groundfish fishing. Conversely, individuals that may be most interested in purchasing additional DAS might be owners for whom current DAS allocations are constraining. To account for these two conditions, a potential seller was defined as any vessel that used 25% or fewer of current DAS allocations and a potential buyer was defined as any vessel that used 50% or greater of current DAS allocations. DAS transfers were modeled as in Option 1 (i.e. by matching 100 randomly selected buyers and sellers sorted by vessel length).

A total of 25 replicates were conducted for each scenario. Also, in each case, sellers were required to sell all of their DAS. Thus, the difference between sellers' allocated DAS and transferred DAS represents a reduction in total allocated DAS. In each scenario, selling vessels were assumed to be required to surrender all Federal permits while purchasing vessels were assumed to be allowed to activate acquired DAS at the proposed rate of 20% each year. An activation schedule of 10% per year is also provided in the analysis.

The median number of transferred DAS was 3,845 and 1,168 DAS transferred for scenarios 1 and 2 respectively. Under Scenario 1 the median number of eliminated DAS due to the conservation tax applied to active and inactive DAS was 6,186 DAS. The median reduction DAS was higher at 7,613 DAS for Scenario 2 because the sample of potential sellers was restricted to vessels that had higher incidence of inactive DAS. This is evidenced by the median inactive DAS of 8,201 DAS as compared to 3,148 inactive DAS for Scenario 1. Assuming vessels were allowed to activate DAS in a graduated schedule of 25% each year, the median number of available days in year 1 would be 644 DAS for Scenario 1 and 217 DAS under Scenario 2. If each selling vessel were also required to surrender all Federal permits then either scenario would result in a reduction of 100 groundfish permits. Note that under Scenario 2 every individual allocation vessel (Category A) used more than 50% of available DAS and were not included in the sellers pool. The less active pool of sellers under Scenario 2 also held fewer limited access permits to fisheries other than groundfish.

	Scenario 1: All Permits			Scenario 2: Buyers Use < 25%, Sellers DAS Use > 50%		
	Minimum	**Median**	**Maximum**	**Minimum**	**Median**	**Maximum**
Seller Allocated Days	8827	9031	9380	8633	8781	8916
Seller Active Days	4673	5883	6585	443	580	713
Seller Inactive Days	4154	3148	2795	8190	8201	8203
Buyer Allocated Days	8779	8981	9265	8798	9180	9712
Buyer Active Days	5001	5693	6391	7611	8136	8596
Buyer Inactive Days	3778	3288	2874	1187	1044	1116
Transferred Days	3219	3845	4230	1085	1168	1248
Reduced Days	5608	5186	5150	7548	7613	7668
Available Transferred Days						
20% Activation Schedule						
Year 1	644	769	846	217	234	250
Year 2	1288	1538	1692	434	467	499
Year 3	1932	2307	2538	651	701	749
Year 4	2576	3076	3384	868	934	998
Year 5	3219	3845	4230	1085	1168	1248
10% Activation Schedule						
Year 1	322	385	423	109	117	125
Year 2	644	769	846	217	234	250
Year 3	966	1154	1269	326	350	374
Year 4	1288	1538	1692	434	467	499
Year 5	1610	1923	2115	543	584	624
Year 6	1931	2307	2538	651	701	749
Year 7	2253	2692	2961	760	818	874
Year 8	2575	3076	3384	868	934	998
Year 9	2897	3461	3807	977	1051	1123
Year 10	3219	3845	4230	1085	1168	1248

Table 321 - Summary of 25 Replicates of Simulated Transactions Under DAS Transfer Proposal

5.4.9.4.4 Alternative 4 – Freeze on Unused DAS

This option was not selected.

The permit freeze in this alternative would improve predictability associated with activation of latent effort. Also, the 5% annual reduction provision might stimulate interest to sell latent permits to buyers under the permit absorption or permit transfer proposals. However, this is not a long-term solution and only defers the problem to a later date. In addition, this action would constitute a long-term commitment to participants and would reduce the Council's flexibility to deal with uncertainties in the future.

The freeze on unused DAS would apply to vessels that fall into latency categories 1 and 2 (as per the DAS transfer proposal definition). Based on these definitions there were a total of 356 vessels that recorded no groundfish landings in any year from 1994 to 1999 inclusive. With very few exceptions, every one of these vessels had a fleet allocation permit during multispecies fishing year 1999. Therefore, simulating the effect for 100 fleet allocation vessels and varying the assumed participation level can approximate the effect of a freeze on DAS.

Assuming that the freeze duration would be five years, DAS allocations after the freeze would be the same for participating vessels as they were prior to it (i.e. 8,800 DAS for 100 fleet allocation vessels). The DAS reductions increase as the assumed participation level in the freeze declines. Specifically, if only 10% of the inactive vessels enroll in the freeze, aggregate DAS allocations would be 23% lower after five years.

Freeze Participants	***10***	***20***	***30***	***40***	***50***	***60***	***70***	***80***	***90***	***100***
Start	880	1,760	2,640	3,520	4,400	5,280	6,160	7,040	7,920	8,800
Year 1	880	1,760	2,640	3,520	4,400	5,280	6,160	7,040	7,920	8,800
Year 2	880	1,760	2,640	3,520	4,400	5,280	6,160	7,040	7,920	8,800
Year 3	880	1,760	2,640	3,520	4,400	5,280	6,160	7,040	7,920	8,800
Year 4	880	1,760	2,640	3,520	4,400	5,280	6,160	7,040	7,920	8,800
Year 5	880	1,760	2,640	3,520	4,400	5,280	6,160	7,040	7,920	8,800
Freeze Non-Participants	**90**	**80**	**70**	**60**	**50**	**40**	**30**	**20**	**10**	**0**
Start	7,920	7,040	6,160	5,280	4,400	3,520	2,640	1,760	880	0
Year 1	7,524	6,688	5,852	5,016	4,180	3,344	2,508	1,672	836	0
Year 2	7,128	6,336	5,544	4,752	3,960	3,168	2,376	1,584	792	0
Year 3	6,732	5,984	5,236	4,488	3,740	2,992	2,244	1,496	748	0
Year 4	6,336	5,632	4,928	4,224	3,520	2,816	2,112	1,408	704	0
Year 5	5,940	5,280	4,620	3,960	3,300	2,640	1,980	1,320	660	0
DAS After Freeze	6,820	7,040	7,260	7,480	7,700	7,920	8,140	8,360	8,580	8,800
DAS Reduction	23%	20%	18%	15%	13%	10%	8%	5%	3%	0.00

Table 322 - Summary of DAS Allocations Under the Permit Freeze Proposal

5.4.9.4.5 Alternative 5 – DAS Reserve

This option is part of the proposed action. Because vessels enter and exit the fishery, and because of changes in the fishery that resulted from resource conditions and management actions, there are a number of options for defining "effective" effort. This "effective" effort is shown in Table 323.

A brief description of these alternatives, and the impact of choosing each, is described below. In all cases, "landing" refers to the commercial landing of fish for sale, and not to landings by recreational or charter/party fishing vessels. Regardless of the option selected, an appeals process will be necessary to resolve discrepancies between vessel and NMFS records or to consider unusual circumstances. Examples of issues that might be considered in determining effective DAS for individual vessels could include participation in experimental fisheries or scientific research programs. The distributive effects of this proposal are illustrated by permit category, length class and homeport state. Options for further consideration are listed.

Each table includes the distributive impacts of the NMFS latent permit buyback program of 2002. In other words, the historical DAS usage by the permits that participated in the buyout has been subtracted from the overall distributive impacts table. This allows the reader to better understand the long-term impacts of choosing one option over another.

Table 323 includes distributive impact data by permit category, length class and homeport state for the recommended options for defining effective effort. In 2002, NMFS completed a latent effort permit buyback program for the multispecies fishery. The vessels that participated in the buyout program were removed from the fishery in Spring 2002. Since these vessels will not participate in the fishery any longer, the fishery impacts from the options for defining effective effort have been calculated without the inclusion of these vessels. It is important to get a clear picture of what the fishery would look like with the normal level of participation. Since the definition of normal participation has changed due to the buyout, the resulting distributive impacts have been modified to account for these removals. Please refer to the NMFS Northeast Regional Office in Gloucester, MA for detailed information regarding the buyout program of 2002.

The different alternatives for defining effective effort not only result in different total allocations of DAS but also results in different allocations by vessel and would have implications for how vessels may be affected by a DAS reduction. Specifically, for a given target level of Category A DAS the most liberal definition of effective DAS would have disproportional impacts on the most active vessels since these vessels would wind up taking a larger proportional cut in used DAS. In effect, DAS would be transferred from more active vessels to accommodate DAS allocations to less active vessels.

There has been extensive debate over the merits of the DAS allocations resulting from the FW 33 court order, as opposed to adding an additional year to the qualification period and including a "filter" to award DAS only to vessels that actively fish(ed) for regulated groundfish. Option 8 would leave DAS allocations for FY2002 in place and Option 9 would add an additional year to the call-in qualification period but would add the provision that only DAS use in years where landings of regulated groundfish exceeded 5,000 pounds. Effectively, this means that if regulated groundfish landings were less than this threshold, DAS use would be set equal to zero regardless of how many DAS a given vessel may have called-in. A formal analysis of how Option 9 would affect current permit holders is not possible at this time because of the need to simultaneously account for DAS and landings history. The former has been established for the purpose of allocating DAS under the Settlement Agreement while the latter has not been merged with landings data to provide a complete record of DAS and landings for each permit holder.

To provide a preliminary assessment of how Option 9 might affect DAS allocations compared to Option 8 an analysis that simply tracked DAS and landings performance over time was developed. Although individual allocations would differ, using this approach does yield estimates of aggregate DAS allocations that are reasonably close to what would eventually be implemented if Option 9 were to be implemented.

To assure comparability, both Option 8 and Option 9 were evaluated using the same methods. This means that the estimated DAS allocations for Option 8 will not be precisely the same as what was actually implemented for FY2002. Landings history was tracked using dealer data for fishing years 1996 to 2001. In addition, the Option 8 baseline is compared to the Option 9 baseline, even though Option 8 imposes an additional 20 percent reduction on DAS – in essence, incorporating a reduction to help achieve mortality goals into the baseline calculation.

Total DAS allocations under Option 8 were estimated to be 72,856 and were 68,718 DAS under Option 9 (See Table 326 through Table 328for summary information by permit category, length class, and home port state), Of a total of 1,442 permitted vessels 599 would receive the same allocation under either Option 8 or 9. A total of 272 vessels would receive higher allocations under Option 9 than Option 8 while 177 vessels would receive a lower allocation. A total of 394 vessels that received an allocation of 10 DAS under Option 8 would receive no allocation at all under Option 9.

Limited Access Permit	Number of Vessels [pre-buyout]	Number of Vessels [post-buyout]	DAS Allocated FY 99 [pre-buyout]	DAS Allocated FY 99 [post-buyout]	Option 1	Option 2	Option 3	Option 4	Option 5	Option 67	Option 7	Option 8 Base-line	Option 8 less 20%	Option 9
Combination	45	45	2,019	2,019	4,091	1,689	1,497	1,684	1,947	1,634	1,590	1,512	1,210	1,374
Fleet	1,252	1,099	110,176	96,712	49,497	45,147	41,580	50,658	52,570	41,920	45,885	47,399	37,919	43,921
Hook Only	186	131	16,368	11,528	2,346	2,241	1,704	2,992	3,014	2,230	3,201	3,197	2,558	2,049
Individual	136	136	17,112	17,112	22,994	16,285	16,285	16,433	17,645	15,976	15,333	16,098	12,878	16,550
Large Mesh Fleet	29	29	3,480	3,480	1,590	1,544	1,285	1,555	1,575	1,517	1,823	4,650	3,720	4,825
Large Mesh Individual	2	2	CR	CR	CR	CR	CR	CR	CR	CR	CR	(Combined with large mesh fleet shown above)		
TOTAL*	**1,648**	**1,440**	**149,155**	**130,851**	**80,518**	**66,905**	**62,351**	**73,323**	**76,751**	**63,276**	**67,832**	**72,856**	**58,285**	**68,718**

Table 323 - Distributive impacts of recommended options for defining effective effort by permit category.
CR = Cannot report activity for fewer than 4 entities. Totals do not include Large Mesh Individual permit category.

Length Class	Number of Vessels [pre-buyout]	Number of Vessels [post-buyout]	DAS Allocated FY 99 [pre-buyout]	DAS Allocated FY 99 [post-buyout]	Option 1	Option 2	Option 3	Option 4	Option 5	Option 67	Option 7	Option 8 Base-line	Option 8 less 20%	Option 9
Under 30 feet	124	91	10,927	8,023	1,191	1,191	908	1,815	1,818	1,132	1,699	1,925	1,540	1,115
30 to less than 50 feet	926	779	82,787	69,851	28,229	27,100	24,132	31,132	31,922	25,676	29,624	33,095	26,476	30,360
50 to less than 75 feet	426	405	39,285	37,437	33,135	26,548	25,696	28,026	29,746	24,954	25,072	25,672	20,537	25,463
75 feet or greater	174	167	16,468	15,852	18,127	12,198	11,746	12,493	13,416	11,645	11,562	12,165	9,732	11,779
TOTAL	**1,650**	**1,442**	**149,467**	**131,163**	**80,683**	**67,037**	**62,483**	**73,465**	**76,903**	**63,408**	**67,957**	72,856	58,285	68,718

Table 324 - Distributive impacts of recommended options for defining effective effort by length class.

Home-port State	Number of Vessels [pre-buyout]	Number of Vessels [post-buyout]	DAS Allocated FY 99 [pre-buyout]	DAS Allocated FY 99 [post-buyout]	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8 Base-line	Option 8 less 20%	Option 9
CT	17	13	1,487	1,135	846	678	552	632	682	587	520	858	687	373
DE	5	5	515	515	654	427	427	437	477	427	423	(inlcuded in other)		
MA	892	787	81,704	72,464	48,122	39,215	36,895	42,752	44,765	37,657	39,968	42,294	33,835	40,941
ME	215	178	19,954	16,698	10,482	8,762	8,520	9,771	10,300	8,142	8,729	9,427	7,542	9,634
NH	76	72	7,008	6,656	4,053	3,648	3,422	3,990	4,142	3,526	3,674	4,693	3,755	4,730
NJ	77	69	6,776	6,072	2,154	1,977	1,696	2,322	2,386	1,598	2,065	2,311	1,849	1,406
NY	177	154	15,506	13,482	5,724	4,984	4,205	5,594	5,745	4,458	5,049	4,965	3,972	4,258
RI	118	102	10,542	9,134	6,120	5,284	5,031	5,753	6,051	5,055	5,274	6,249	4,999	5,546
Other	73	62	5,975	5,007	2,529	2,061	1,735	2,214	2,355	1,959	2,255	2,059	1,647	1,830
TOTAL	**1,650**	**1,442**	**149,467**	**131,163**	**80,683**	**67,037**	**62,483**	**73,465**	**76,903**	**63,408**	**67,957**	**72,856**	**58,285**	**68,718**

Table 325 - Distributive impacts of recommended options for defining effective effort by homeport state.

Permit Category	Number of Permits	Option 8 Baseline	Option 9	Number of Vessels with No Change in Allocations	Number of Vessels with Increased Allocations	Number of Vessels with Reduced Allocations	Number of Minimum Allocation Vessels with No Allocation
Individual	138	16098	16550	113	20	0	5
Fleet	1065	47399	43921	427	207	132	299
Hook_Only	130	3197	2049	23	14	27	66
Combination	46	1512	1374	18	4	8	16
Large Mesh (Combined F & G)	63	4650	4825	18	27	10	8
Totals	1442	72856	68718	599	272	177	394

Table 326 – Comparison of Option 8 and Option 9 baselines, by permit category

	Number of Permits	Option 8 Baseline	Option 9	Number of Vessels with No Change in Allocations	Number of Vessels with Increased Allocations	Number of Vessels with Reduced Allocations	Number of Minimum Allocation Vessels with No Allocation
Under 30 feet	97	1,925	1,115	12	10	17	58
30 to less than 50 feet	779	33,095	30,360	245	177	121	236
50 to less than 75 feet	398	25,672	25,463	232	72	29	65
75 feet or greater	168	12,165	11,779	110	13	10	35
Totals	1,442	72,856	68,718	599	272	177	394

Table 327 – Comparison of Option 8 and Option 9 baselines, by vessel size category

	Number of Permits	Option 8 Baseline	Option 9	Number of Vessels with No Change in Allocations	Number of Vessels with Increased Allocations	Number of Vessels with Reduced Allocations	Number of Minimum Allocation Vessels with No Allocation
CT	17	858	373	3	1	9	4
MA	779	42,294	40,941	339	157	89	194
ME	179	9,427	9,634	70	43	9	57
NH	75	4,693	4,730	23	31	7	14
NJ	77	2,311	1,406	26	2	17	32
NY	143	4,965	4,258	62	17	21	43
RI	114	6,249	5,546	58	13	17	26
Other	58	2,059	1,830	18	8	8	24
Totals	1442	72,856	68,718	599	272	177	394

Table 328 – Comparison of Option 8 and Option 9 baselines, by homeport state

5.4.9.4.6 Alternative 6 – Mandatory Latent Effort Categorization

This option was not selected. The Groundfish Plan Development Team originally designed Alternative #1 so that the DAS available for use in Amendment 13 would be commensurate with current resource status, possibly, in lieu of other management tools for groundfish (e.g. trip limits, etc). The original intent of the PDT was to define effective effort as the number of DAS used in the most recent fishing year. In fishing year 1999, this would have resulted in 53,500 DAS. However, since that time, the Capacity Committee have chosen a suite of options for defining effective effort for #4, 7, 8a and 8b which allow for a range of category A DAS between 67,000 and 75,000. This range automatically indicates an increase in fishing mortality if all Category A DAS were fished upon implementation of Amendment 13. It also indicates that more Category A DAS allowed at the start of Amendment 13 will lead to greater reductions for the fleet as a whole to meet target mortality reductions.

If the Council, in the development of Amendment 13, decides not to take a DAS cut and does not define Category B days, then it is assumed that Category C DAS cannot be reactivated until other measures used to achieve the goals of Amendment 13 are removed (e.g. closures and trip limits). If this is the case, then the Council should be concerned a potential increase in effort in the groundfish fishery if the number of Category A DAS exceed current fishing levels. Allowing permit transfers may cause fishing effort to increase.

5.4.9.5 Management Alternatives to Address Rebuilding Requirements

5.4.9.5.1 Proposed Action

No additional analyses.

5.4.9.5.2 No Action

No additional analyses.

5.4.9.5.3 Alternative 1

No additional analyses.

5.4.9.5.4 Alternative 2

VMS Considerations

VMS is required for the 76 vessels that fish in both the Gulf of Maine and Georges Bank areas, and the 116 vessels expected to participate an exempted fishery for yellowtail in closed area II on Georges Bank. These 192 vessels, at $2900 per unit including the PC, would cost $556 thousand initially. Their days-at-sea are unknown, thus communications and double-pinging costs are unknown as well. Additionally, safety could be enhanced with distress buttons on each unit, and costs $211 thousand for these 192 boats.

5.4.9.5.5 Alternative 3 – Area Management

Area Fished Restrictions

This alternative includes several options that limit the ability of fishermen to move between proposed management areas. This could inhibit their ability to target specific species and may result in a loss of revenue. Option 5, the most restrictive of these options, proposes to limit vessels to one management area over the course of the year. To illustrate how many vessels might be affected by this restriction, VTR records were examined to determine the number of management areas vessels fished during a given year for the 1996 through 2000 fishing years. Only reports with valid positions were used. Results are shown in

Table 329. Analysis was limited to vessels that reported landing one of the ten large mesh groundfish species using trawl, longline, or gillnet gear.

For all area management options except Option 5, about two-thirds of the permitted vessels fished in only one management area during the entire time period. Option 5 areas, however, show that roughly one-third (37 percent) of the vessels fished in one area, and about three-fourths (73 percent fished in only two areas during the entire time period. The patterns of activity are fairly constant when individual fishing years are examined. Generally, about 80 percent of the vessels fish in one area defined in five of the six management areas during any of the fishing years between 1997 and 2000. The percentage is roughly two-thirds in 1996, lower than the following years. In all years, about three-fourths of the vessels fished in two of the management areas defined in Option 5, and about 10 to 15 percent of vessels fished in only one of these areas between 1997 and 2000.

In summary, if area management options 1, 2, 3, 4, or 6 are adopted, and vessels are restricted to one management area during a given fishing year, roughly three-fourths of the vessels will not have to alter the way they fished during fishing years 1996 through 2000. Differences between these options are very minor, but Option 2 appears to have the least impacts on the observed patterns of fishing activity if vessels are restricted to one management area during a fishing year. If Option 5 were adopted, however, far more vessels would be impacted by a restriction to one area. These expected results could be influenced by changing distributions of fish as stocks recover, or if new management measures move vessels into different areas.

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
All Years						
Areas Fished	*Cumulative %*	*Cumulative %*	*Cumulative %*	*Cumulative %*	*Cumulative %*	*Cumulative %*
1	67%	68%	63%	64%	37%	64%
2	86%	87%	86%	87%	73%	84%
3	96%	98%	96%	98%	92%	98%
4	100%	100%	100%	100%	98%	100%
5	100%	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%	100%
1996						
1	78%	79%	76%	78%	12%	75%
2	95%	96%	95%	96%	74%	94%
3	99%	100%	99%	100%	95%	100%
4	100%	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%	100%
1997						
1	80%	82%	78%	81%	11%	76%
2	97%	97%	97%	97%	78%	95%
3	100%	100%	100%	100%	97%	100%
4	100%	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%	100%
1998						
1	79%	81%	80%	83%	13%	75%
2	97%	98%	97%	98%	78%	97%
3	100%	100%	100%	100%	98%	100%
4	100%	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%	100%
1999						
1	79%	83%	80%	83%	15%	77%
2	98%	98%	98%	98%	79%	96%
3	100%	100%	100%	100%	98%	100%
4	100%	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%	100%
2000						
1	81%	83%	79%	81%	13%	78%
2	97%	98%	97%	98%	76%	97%
3	100%	100%	100%	100%	98%	100%
4	100%	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%	100%

Table 329 – Number of proposed area management areas fished by vessels, fishing years 1996 through 2000.

VMS Considerations

VMS is required for all vessels moving between areas within a single trip. This includes options 1 through 4 and 6, but not option 5 (one management area per fishing year), for vessel movement between areas. Five of the area configurations (options 1-4 and 6) result in about 20% of the vessels expected to move between areas on a fishing trip. These 152 vessels, at $2900 per unit including the PC, would cost $440 thousand to purchase VMS. Their days-at-sea are unknown, thus communications and double-pinging costs are unknown as well. Additionally, safety could be enhanced with distress buttons on each unit, and costs $167 thousand for these 152 boats.

The other area configuration (option 5) results in at least 80% of the vessels expected to move between areas on a fishing trip. These 762 vessels, at $2900 per unit including the PC, would cost $2.2 million to purchase VMS. Their days-at-sea are unknown, thus communications and double-pinging costs are unknown as well. Additionally, safety could be enhanced with distress buttons on each unit, and costs $838 thousand for these 762 boats.

5.4.9.5.6 Alternative 4 – Hard TAC

VMS Considerations

This alternative has three options for reporting, two of which (options 2 and 3) do not require VMS.

To cover the entire fishing fleet (option 1) of 1484 vessels, at $2900 per unit including the PC, would cost $4.3 million initially. Although fishing effort is reduced to half the 73,063 DAS allocated, it is expected that the vessels will place those days-at sea (one-for-one) in other fisheries, in order to stay in business. With 73,063 days-at-sea (with the VMS shut off while the vessel is tied to the dock) adds $73 thousand per year. Double-pinging to protect closed areas or participate in exempted fisheries add $70 thousand annually. Safety may be enhanced by including distress buttons on each unit, and costs $1.6 million for the 1484 boats and vessels, but this is not a requirement for groundfish management.

However, the benefits of total fleet coverage, especially to a multispecies fishery like that managed by the groundfish FMP, are much greater than tallying the official DAS and protecting the large, fixed closed areas. If all vessels require VMS, even partial closed areas become somewhat more inviolate because the enforcement agencies can identify every boat that enters them at any time. Likewise, corroboration of other reporting will be comprehensive rather than piecemeal, as it is with less than full VMS coverage. Safety at sea coverage will be comprehensive, and the extra $1100 per unit for this purpose adds only $1.6 million, to protect nearly 1500 U.S. vessels at sea. Any requirements for sampling at sea will be greatly enhanced with full VMS coverage, because the density of fishing vessel activity in the various fish stock areas will be known. Observer and Homeland Security programs will be enhanced, in similar fashion. Finally, trip limits, gear restrictions, fish sizes and other management measures may be affected.

5.4.10 Tuna Purse Seine Vessel Access to Groundfish Closed Areas

There are five quota categories in the Atlantic Bluefin Tuna (BFT) fishery, with a total of 24,179 permitted vessels (Table 330). The primary market for bluefin tuna caught by the General and Purse Seine category vessels is Japan. As a fresh fish market, ex-vessel prices are highly sensitive to market supply. Carrol (1998) found that ex-vessel prices were correlated negatively with the quantity of U.S. catch. An increase of one percent in the supply results in a 0.05 percent drop in price for a single fish.

Quota Category	Number of Permitted Vessels
General	9,226*
Harpoon	44
Purse Seine	5
Longline and Trap	287
Angling	14,617
TOTAL	24,179

Table 330 – Number of permitted tuna vessels, 2000. *Includes Charter/Headboat permitted vessels. Source: NMFS Atlantic Tunas Vessel Permit Database. (NMFS 2001b)

The General Category fishery is managed through a quota that is distributed over the course of the year through time period sub-quotas. The sub-periods are June through August, September, and October through December. There are typically large spikes in bluefin tuna landings at the beginning of a sub-period, particularly if the previous period closed (Scida, pers. comm.). The findings of Carrol (1998) suggest that these surges in landings probably depress the price received by General Category vessels. This may be supported by the lower average ex-vessel price received by this permit category, as compared to the tuna purse seine vessels, in 1998 and 1999 (Table 331).

Category	1998 Gross Revenues (Avg. Price)	1999 Gross Revenues (Avg. Price)
General	$7,472,566 ($6.26)	$9,855,686 ($8.16)
Purse Seine	$3,161,708 ($7.23)	$3,457,119 ($7.82)

Table 331 – Gross revenues for General and Purse Seine category tuna vessels, 1998 and 1999. Source: NERO Bluefin Tuna Dealer Report Database. (NMFS 2001b)

5.4.10.1 Option 1 – Status Quo

This option was not selected . Under this option, there are no changes to current fishing practices. Fishing vessel revenues and operating costs are not expected to change. Therefore, there is no net change in the economic impacts under this option. As a result of the status quo, however, tuna purse seine vessels are limited in the area that they can fish. This may constrain their ability to fish at times that avoid the seasonal glut of tuna landings that result from the General Category sub-period openings. If this occurs and purse seine vessels land their catches at the beginning of a sub-period, ex-vessel prices could be depressed resulting in lower gross revenues for both the General and Purse Seine category vessels. It is not possible to predict how often this may occur, since the distribution of tuna varies considerably over time.

5.4.10.2 Option 2 – Access With Restrictions

This option was not selected. This option will allow tuna purse seine vessels to fish in all groundfish closed areas, but limits fishing in closed areas to water depths of 30 fathoms or greater (or alter nets to less than the depth of water) and excludes the vessels from any HAPC.

Allowing vessels to fish in closed areas may reduce vessel operating costs because it expands the area available to locate and fish on tuna schools. While allowing tuna purse seine vessels to fish in three areas presently closed to them may decrease vessel costs, this option also significantly changes current access to the seasonal closures in the Gulf of Maine and the WGOM closed area. Most of the seasonal closures occur in the winter and early spring and are not in effect during the purse seine fishing season. The Cashes Ledge closure (July through October, November if triggered) and the October and November closures of thirty minute square blocks 124 and 125 do occur during the purse seine season. In addition, the year round WGOM closure area may also be important to purse seine vessels.

As a result, because this alternative improves access in some areas but limits access in others (compared to the status quo), the economic benefits are likely to be neutral or negative. The precise impact will depend on the distribution of tuna and fishing effort, which can change significantly from year to year. If vessels choose to alter their nets to fish in shallower water, operating costs are likely to increase and as a result net revenues will decline.

It is unlikely that this option will have any significant impacts on groundfish landings or revenues. The bycatch of groundfish resulting from this option is not likely to be significant enough to affect stock rebuilding plans or current fishing activities. As a result, it should not have any economic impacts on groundfish vessels.

This option does provide some increased ability for purse seine vessels to avoid fishing during periods of high landings from General category vessels because it allows partial access to all groundfish year round closed areas. This may reduce the likelihood and extent of market gluts and result in higher ex-vessel prices for both categories of vessels.

Because certain types of fixed gear are allowed in the groundfish closed areas (lobster and hagfish pots), allowing tuna purse seine vessels into these areas may increase the likelihood of gear conflicts. NMFS enforcement has not received and recent reports of gear conflict incidents, and none were reported during the experimental fishery in Closed Area I in 2000. Given the small number of tuna purse seine sets, the likelihood of significant gear conflicts is very low.

5.4.10.3 Option 3 – Access Without Restrictions

This is the proposed action. This option increases the area available for tuna purse seine fishing vessels. As a result, it may reduce purse seine fishing costs, increasing net revenues. While there may be some groundfish bycatch within the closed areas, it is not clear that this will represent an increase in bycatch or just a shift in the location of the low bycatch levels that may be occurring. In either case, the amount of groundfish bycatch is unlikely to be sufficient to affect either rebuilding programs or current fishing activities. As a result, it should have little or no economic impact on groundfish vessels.

This option also provides the greatest flexibility for purse seine vessels seeking to avoid fishing during periods of high landings from General category vessels. While it is not possible to predict the extent that this will reduce the likelihood of market gluts, if it does help spread landings of tuna over time it should increase ex-vessel prices and gross revenues for both permit categories.

Because certain types of fixed gear are allowed in the groundfish closed areas (lobster and hagfish pots), allowing tuna purse seine vessels into these areas may increase the likelihood of gear conflicts. NMFS enforcement has not received and recent reports of gear conflict incidents, and none were reported during the experimental fishery in Closed Area I in 2000. Given the small number of tuna purse seine sets, the likelihood of significant gear conflicts is very low.

5.4.11 Northern Shrimp Fishery Exemption Area

5.4.11.1 Background

While there is significant literature on the biology of *Pandalus borealis*, detailed economic statistics on the New England shrimp industry have not been compiled and described since the 1986 ASMFC FMP for northern shrimp. There are, however, recent sources (Clark et al. 2000; Hall-Arber and McCarron, unpub. draft) that contain descriptive information on economic aspects of the current fishery.

The following excerpt is from Hall-Arber and McCarron:

"Traditionally, Maine landings dominated the shrimp fishery. It began in the 1930s as a winter inshore fishery, rising to landings of a half-million pounds by 1945 before a steady decline ensued. In the 1960's landings increased again, reaching a total of 23,553,000 pounds (12,800 mt) in 1968-69. By this time, the small Maine fleet had grown from a handful of inshore, side-rigged trawlers to over 200 draggers, including stern trawlers. In addition, a portion of the fleet worked year-round and offshore. New Hampshire boats also joined in the fishery in 1966, though landings were minor through the 1970s. Massachusetts' boats had a nominal presence up until 1969, but rapidly increased in numbers thereafter. Nevertheless, Maine's landings far exceed those of any other state, landing 72% of Atlantic's marine shrimp catch in 1997, 67% in 1998, 41% in 1999, and 70% in 2000. Looking only at New England, Maine's catch in 1997, 1999 and 2000 was 86% of the total, slipping only in 1998 to 82% of New England's total landings."

The following excerpt is from Clark et al.:

"Participation in Maine has been based both on potential economic returns between lobsters, scallops, groundfish and shrimp and vessel size. Maine participants have succeeded by being versatile, re-rigging their vessels in response to costs, ex-vessel prices and availability of target species. When shrimp are available in sufficient quantity and ex-vessel prices are high, they are attractive to larger numbers of the more versatile vessels and total effort may increase dramatically. Maine vessels have continued to operate primarily out of Portland and smaller ports further east.

New Hampshire landings increased rapidly in the mid-1980s and vacillated around an average of 10% of the total through the 1990s, exceeding those of Massachusetts in some years. New Hampshire's fleet fishes out of only three small ports.

The Massachusetts fishery expanded rapidly in the 1980's; landings surpassed the Maine total from 1979 to 1981 and remained significant until 1992. The number of participating vessels increased to about 80 by the end of the decade, but then declined, with the exception of a brief resurgence in 1995 and 1996. The decline in recent years reflects a number of factors including fleet reductions associated with severe restrictions in the groundfish fishery and federal "buyback" programs, recent declines in abundance and quality of shrimp with concomitant poor prices, and availability of other options during the shrimp season. Less than 30 vessels participated during the 1998 fishing season, and Massachusetts accounted for only 6% of the total during that year. As was the case for earlier years shrimp have been landed primarily in Gloucester and smaller ports further north.

...Currently, the shrimp fleet is comprised of lobster vessels in the 9-14 m *(30-46 ft.)* range that re-rig for shrimping, small to mid-sized stern trawlers in the 12-17 m *(39-56 ft.)*, and larger trawlers primarily in the 17-24 m *(56-79 ft.)* range."

Hall-Arber and McCarron further stated:

"The numbers of vessels involved in the fishery also varies from year to year... [I]n 1996 when landings reached 9,500 mt, there were 350 vessels in the fleet. The following year, when landings dropped, there were only 260 boats in the fleet. The sizes of the vessels also vary. At one time, the 30 ft. boats predominated, now boats as large as 90 to 100 ft. might rig over...

...The majority of the shrimp boats work out of smaller ports, though not necessarily the same small ports every year...

...Lower Mid-Coast Maine predominates in shrimping compared to the other sub-regions in Maine. Portland, Cundy's Harbor, Boothbay Harbor and South Bristol are all in Lower Mid-Coast Maine. The Portland Fish Exchange holds a daily shrimp auction in season. Maine's largest processor of shrimp is located in Portland. Boothbay and South Bristol each have a local shrimp processor, though they also ship some shrimp to Portland for processing...

...The small ports where shrimp constitutes a significant proportion of landings consider fishing an important feature of their economy...

... Shrimp is an essential component of the year's fishing returns for individual vessels from Rye, Hampton and Portsmouth and for both of New Hampshire's fishing cooperatives. Furthermore, boats from Newburyport (Massachusetts) and York (Maine) are shrimp-landing members of the Yankee and Portsmouth Coops, respectively, so the shrimp networks clearly extend beyond the borders of states and sub-regions in New England...

...According to *Fisheries of the U.S*., commercial landings of shrimp in New England in 1999 were 3,812,000 pounds worth $3,579,000. In 2000, 5,361,000 pounds were landed valued at $4,335,000. Maine's statistics are by shrimp season, so they reported 3,148,326 pounds in 1998-99, 3,795,098 in 1999-2000, and 1,326,537 in 2000-2001. These numbers are in great contrast with 1997-98's 6,698,817 pounds."

Maine DMR issued 561 licenses for the 2000-2001 season. For 1999-2000, 566 licenses were issued. Of those license holders who reported in 1999-2000, 38% reported not fishing.

The following summary statistics from the NMFS Dealer and Permit Databases (provided by NEFMC staff) represent values for gross revenues and landings by federal multispecies permit holders using shrimp trawls during 1994-2000:

Year	No. vessels*	Landings (lbs.)**	Revenue
1994	260	12,419,759	$11,652,785
1995	292	15,736,254	12,004,664
1996	300	14,899,863	11,777,977
1997	279	8,360,126	7,798,372
1998	212	3,092,773	2,764,960
1999	217	4,507,649	3,529,628
2000	197	1,603,521	1,305,416

*represents only vessels using shrimp trawls and holding multispecies permits
**represents all non-multispecies landings (could include species other than shrimp)

These numbers may be indicative of some trends in the shrimp fishery, but likely do not represent the Maine fishery very well, as most of the Maine shrimp fleet are not multispecies permit holders.

5.4.11.2 Option 1 No Action

This Option would not change the economic conditions in the shrimp fishery. It was not selected.

5.4.11.3 Option 2 Eliminate Area Restriction for the Northern Shrimp Fishery

This option is the proposed action. The area outside the 25600 line that holds any appreciable amount of shrimp is very limited compared to the area of the rest of the Gulf of Maine that would become available if the preferred alternative is put in place. The 25600 line bisects three general areas in the vicinity of Cashes Ledge that were traditional spring fishing grounds. The fishermen want these areas reopened to shrimping.

Shrimp in the GOM are patchy in abundance and migrate differentially with age. Males migrate offshore over a two year period from their place of birth. They function as males offshore and then remain there for the next year, transforming into females. They will mate as females in the following summer and will then migrate inshore as the eggs develop during the fall and early winter. They will remain inshore until larval release has occurred and then migrate offshore to repeat the process.

Thus the occurrence of shrimp offshore, outside the 25600 line, in the spring and therefore the desire to have a fishery there is a function of the strength of the 'resident' year class offshore, ie. the transitionals, and the rate of movement offshore of the males and females. This last May, 2001 the resident year class was the 1998 year class, which was the weakest on record in the history of the survey (since 1983). Also, the female shrimp were delayed in their offshore migration possibly due to the inshore waters of the GOM remaining colder than normal through the late winter and early spring. Thus there were no shrimp, or very few to be found in the area where the experimental fishing was done. This is not always the case. Historical records from the Maine port sampling program show an average of 179 pounds per hour towing in the vicinity of Cashes Ledge between Platts Bank and Jeffreys Bank (Table 2). Samples were collected for trips made between 1988 and 1999. Not all years are represented as not all years had a May fishery and shrimp were not present in attractive enough numbers during some years, at least fishermen's choice did not place the sampled trips there.

There are currently 50 fishing vessels with a LOA of at least 50 feet registered in Maine for the taking of shrimp. Of these, about a dozen actively fish in the neighborhood of the 25600 line during the spring fishery in years when there is a concentration of shrimp there. From NMFS records, the number of trips in May in the shrimp fishery are minimal compared to the winter months (Appendix III, Table 3). These trips are likely to be two to three days in duration whereas the winter trips are uniformly day trips. Assuming an average spring trip to be two days duration, the effort expended on the shrimp fishery in days fished is still small in the spring compared to the winter in any one season. Few vessels, if any from New Hampshire or Massachusetts would travel the distance required to fish outside the current boundaries of the Small Mesh Exemption Area due to their size and their relatively greater distance from the likely offshore shrimp beds.

The number of vessels that will participate in the spring shrimp fishery is not estimated to change appreciably if the area outside the 25600 line is opened. Also, the choice whether or not to fish for shrimp will probably not be affected severely. Thus the fishery is expected to maintain its traditional spring fishing effort level and the extent to which the area outside 25600 is accessed will simply be a spreading out of effort, diminishing effort inside the line. Whether or not there are more shrimp outside the line than inside in any given year will determine where the fishery will be. In some years there may be a higher concentration of shrimp in the vicinity of the line, rather than well inside the line and in those years there will probably be effort expended there. The line bisects offshore beds that shrimp will move into if they move that far offshore. Shrimp are not known to move beyond these beds in any great concentrations based on spring (NEFSC), summer(ASMFC) and fall (NEFSC) survey data. Thus in those years when the shrimp move that far offshore, the fishing will be spread out over the whole bed, rather than over the inside half of the bed. The fishing offshore usually lasts two to three weeks and usually occurs as late as possible in the spring. Benefit to the fishermen may accrue with the opening of the full beds by having their CPUE remain higher over time as their fishing, spread out over the entire bed, will not disturb and thus disperse the shrimp as much. The increased mortality of shrimp must be measured as the difference between CPUE inside the line if the line were not removed and both inside and outside the line if the line were removed. Given the area involved and the numbers of fishing trips that occur in May, this difference is not expected to be very great, but may well exist.

5.4.12 SNE General Category Scallop Exemption Program

This program will mitigate the economic impacts of the proposed restrictive groundfish regulations. In the scallop fishing year from March 1999 through February 2000, 69 vessels with a general category permit used dredges to land over 61,000 pounds of sea scallops worth about $500,000 (2001 Scallop SAFE Report), an average of about $7,200 per vessel. There are 815 vessels limited access multispecies vessels with general category permits (this number could increase, as it is an open access permit). If all of these vessels were to participate in the program (an unlikely proposition given the location of the area), revenues of $5.8 million will accrue. Vessels most likely to take advantage of this program are those adjacent to the area - vessels homeported in Rhode Island, southern Massachusetts, or New York.

5.4.13 Impacts on Other Fisheries

Management measures adopted in Amendment 13 may impact other fisheries (and the stocks managed by those fisheries) in two different ways. First, regulations implemented to manage groundfish may also directly restrict catches of other stocks. For example, many fishermen catch skates, monkfish, and dogfish while fishing on groundfish DAS. Reducing effort in the groundfish fishery will likely result in reduced catches of these stocks as well. Another way other fisheries will be affected is if additional closed areas are adopted with restrictive access provisions, whether to reduce groundfish mortality or to minimize the adverse effects of fishing on habitat. Second, fishermen may increase their participation in other fisheries in order to make up revenue lost because of restrictive groundfish regulations. This may exacerbate effort control problems in those fisheries and result in a cascading need for additional management action to achieve OY in those fisheries.

5.4.13.1.1 Impacts of Closed Areas

A number of alternatives in this Amendment, if adopted, will change existing year round closed areas, to minimize the adverse effects of fishing on essential fish habitat to the extent practicable. The "worst case" impacts of additional closed areas can be estimated by assuming that vessels are not able to replace the catches taken from a newly closed area – in other words, there is "no displacement" of effort into other areas to make up the lost catches. For sedentary species like scallops, this may be a reasonable approximation of the losses that may accrue. It does not, however, take into account the stock dynamics of the resource and thus may under-estimate impacts for a stock with rapid growth and high fecundity, or a stock that is rapidly rebuilding. This approach does not analyze the possible distributive effects of the closures. Finally, this approach does not take into account management choices that can mitigate the impacts – such as a closed area access program for scallop vessels (assuming the closures are not also closed to minimize adverse effects of fishing on habitat). The results should only be used to compare alternatives and to indicate the relative magnitude of the impacts, but should not be viewed as predictions of actual revenue declines.

The general approach used to analyze closed area impacts, and the analysis of the various habitat closure alternatives are described in section 5.3.10.

5.4.13.1.2 Impacts of Gear Requirements/Restrictions

Scallop Twine Top Requirementin the Inshore GOM

Rebuilding Alternative 2 would have implemented a requirement for the use of a ten-inch twine top for scallop dredges fishing in thirty minute squares 114, 115, 123, 124, and 125. The purpose of this requirement is to reduce the bycatch of CC/GOM 9.4.2.8.3.7. According to SAW-36, scallop dredge discards account for approximately 30 percent of the CC/GOM yellowtail flounder discards, though the percentage declined in 2001 and was only 30 mt out of a total of 484 mt of discards. Given the large reductions in fishing mortality necessary to rebuild CC/GOM yellowtail flounder, however, 30 mt of discards is about 15 perent of the total catch in 2004.

The use of large mesh twine tops to reduce finfish bycatch has shown promising results in recent experiments. Draft Amendment 10 to the Atlantic Sea Scallop Fishery Management Plan contains a summary of these experiments, and the following information was extracted from that document.

Smolowitz et al (1997) reported that increases in the mesh size of the twine top significantly reduced the number of flatfish captured by the dredge. Comparisons of a 6" diamond mesh twine top with that of an 8" square mesh resulted in a 37% reduction in the harvest of yellowtail flounder (1,674 versus 1,042; 78 tows). A similar experiment comparing a 6" diamond mesh twine top with that of a 10" diamond mesh resulted in a 45% reduction in the harvest of yellowtail founder (605 versus 300; 50 tows). The reductions in the number of yellowtail harvested by the dredge using the larger mesh twine tops were statistically different at the 95% confidence level. The use of a 10" twine top reduced the amount of scallops captured.

In 1998, DuPaul and Kerstetter (unpublished data) tested the use of larger mesh twine tops to reduce the bycatch of summer flounder in the mid-Atlantic. A comparison between a 6" diamond mesh twine top with that of an 8" diamond mesh produced inconsistent results that were not statistically different (292 versus 265; 28 tows). A comparison of a 6" diamond mesh twine top that of a 9.5" knotcenter diamond mesh hung on the diagonal significantly reduced the catch of summer flounder by

42% (543 versus 310; 66 tows). Hanging the twine top on a diagonal resulted in an "open diamond" configuration similar to a square mesh. The harvest of scallops during this test was highly variable from tow-to-tow due to rough weather and a scarcity of scallops (1-3 baskets per dredge per tow). No conclusions relative to the harvest of scallops could be made.

In 1998, during the cooperative NMFS/Industry/Academia survey of the Georges Bank Closed Area II (CAII), comparative tows using larger mesh twine tops were made both inside and outside the boundaries of CAII (DuPaul et al 1999). A comparison between an 8" diamond mesh twine top with that of an 8" square mesh produced no significant reductions in the catch of yellowtail flounder (p=0.233) and blackback flounder (p=0.670) during the survey within the boundaries of CAII (224 tows). The catch of scallops were not statistically different. In a second experiment outside the boundaries of CAII, an 8" diamond mesh twine top was compared with that of a 12" square mesh. Significant reductions in the capture of blackback flounder (p=0.004), windowpane flounder (p=0.003) and monkfish (p=0.041) were observed. The reduction in the catch of yellowtail flounder was not significant (219 versus 188; p=0.082). There was a highly significant reduction in the harvest of scallops (p=0.000). A total of 34 tows were made.

These recent studies indicate that increasing the mesh size of the twine top can be effective in reducing finfish bycatch in the sea scallop dredge fishery. However, it is also apparent that increases in mesh size must be balanced with undesirable losses in scallop production.

5.4.13.1.3 Displacement of Effort Into Other Fisheries

Groundfish vessels owners may increase their activity in other fisheries as a result of restrictive groundfish regulations. Their ability to shift into other fisheries will depend on what permits they hold. Limited access multispecies permit holders may hold permits to several other fisheries that would permit them to enter these. To examine what permits are held by these vessels and whether they have participated in alternative fisheries, permit data for permit year 2002 were merged with calendar year 2001 dealer data. Permit categories not regulated by DAS controls were excluded. With the exception of general category scallop and herring permits, the query on permits for other fisheries was limited to limited access or moratorium permits only since the ability to redirect effort to other fisheries will be limited if the vessels does not hold a necessary permit. Dealer data was summed by permit holder to ascertain 1) whether a given vessel had any record of fishing activity; 2) relative dependence on groundfish; and 3) evidence of activity in fisheries other than groundfish. For the latter, activity was defined as having recorded any sale of the given species through the dealer reporting system. Note that this may provide a biased estimate of activity and dependence on groundfish for vessels in Connecticut and Delaware, particularly if the vessel does not land in any other state.

During calendar year 2001 279 of the 1,391 limited access permit holders reported no activity in the dealer data. Of the vessels that did report activity 157 did not report landing any of the 10 large mesh species; 235 relied on groundfish for less than 25% of fishing revenue; 134 depended on groundfish for 25% or more but less than 50% of revenues; 190 depended on groundfish for 50% or more but less than 75% of revenues; and 396 vessels relied on groundfish revenue for 75% or more of total fishing revenue. Of the vessels most dependant (50% or more) on groundfish, nearly three-quarters had permits for bluefish, dogfish, lobster, monkfish, illlex and/or loligo squid, and general category scallop permits. Vessels with lower dependence on groundfish typically held a similar suite of permits but a large proportion of these vessels also held a summer flounder permit.

Holding a permit does not necessarily mean that a vessel participates in the permitted fishery. Of the alternative permits held by vessels most dependent on groundfish, only monkfish and summer flounder were used by 50% or more of the vessels that held these permits. The number of fisheries where this criterion is met increases as dependence on groundfish decreases. For example, fisheries with 50% or greater participation for vessels in the 50-75% dependence interval included black sea bass, summer flounder, monkfish, squid, and small mesh multispecies. For vessels below 50% dependence bluefish and scup are added to the list. Note that vessels that were active but did not land any groundfish tended to have participation limited to black sea bass, summer flounder and squid and to a lesser extent monkfish.

The economic analysis indicates the vessels that will be most affected by the Amendment 13 alternatives are those vessels that are dependent on groundfish for a 75 percent or greater of their gross revenues. A large number of these vessels have monkfish, dogfish, general category scallop, or bluefish permits. Ability of these vessels to move into the monkfish or dogfish fisheries is constrained by current regulations in those fisheries. Currently, limited access groundfish vessels are charged a groundfish DAS when fishing for monkfish, which means if the amendment constrains groundfish DAS they will not be able to expend much additional effort on monkfish. Dogfish quotas are very restrictive. If additional effort is shifted into that fishery, season will close even more rapidly than at present and the derby nature of that fishery will be exacerbated. If significant numbers of vessels begin to use their General Category Scallop permits, it will complicate scallop management and the possible development of the scallop rotational area management system in Amendment 10.

Less than 10 percent of the vessels that rely heavily on groundfish have squid permits, limiting the impacts of shifts in effort from these vessels. At lower levels of groundfish dependence, there are 244 vessels with squid permits and 82 percent reported landing squid in fishing year 2001. This suggests it will be relatively easy for these vessels to redirect effort into the squid fishery. This fishery is also managed through seasonal quotas, and increases in effort will likely exacerbate the derby fishery nature of quota fisheries. Smaller groundfish vessels may also fish for tuna or enter the party/charter fishery. Other opportunities for groundfish trawl vessels include the open-access whiting and herring fisheries. The low prices and competitive markets may limit the ability of vessels to move into these fisheries.

Much of the ability to shift into other fisheries is limited to trawl gear. Gillnet and longline fishermen who in the past fished for monkfish and dogfish have few opportunities to do so because of restrictions in those fisheries (see discussion above). Whiting, squid, and herring are not harvested with gillnet or longline gear in the U.S. Some small gillnet and longline vessels may be able to target tuna at certain times of the year, or shift into the party/charter fishery in an attempt to compensate for loss of gross revenue.

	No Activity	No Groundfish		< 25% Groundfish		25% Groundfish to < 50%		50% Groundfish to < 75%		>= 75% Groundfish	
Permit (Fishery)	Number with Permit	Number with Permit	Number with Landings	Number with Permit	Number with Landings	Number with Permit	Number with Landings	Number with Permit	Number with Landings	Number with Permit	Number with Landings
Multispecies	279	157	0	235	235	134	134	190	190	396	396
Black Sea Bass	42	80	49	149	128	76	63	39	28	40	11
Bluefish	194	123	52	219	151	129	72	154	53	338	98
Dogfish	209	131	8	220	75	126	35	166	39	331	74
Summer Flounder	54	69	49	170	144	101	86	77	41	109	56
Lobster	190	114	38	210	97	115	55	154	60	293	104
Herring	136	82	3	175	4	106	6	151	2	253	0
Monkfish	190	124	53	226	204	128	121	185	179	344	272
Scallop (Limited Access)	3	14	14	28	28	15	12	3	2	1	0
Scallop (General Category)	194	105	15	190	57	112	29	173	31	340	60
Squid (Illex or Loligo)	21	26	18	116	106	66	62	44	33	35	14
Scup	59	82	23	165	119	86	61	65	28	64	12
Tilefish	3	4	1	4	3	1	1	1	0	2	0
Whiting/Offshore/Red Hake	279	157	26	235	144	134	88	190	107	396	171

Table 332 - Summary of Permits Held by Limited Access Permit Holders and Participation in Other Fisheries by Multispecies Revenue Dependence

5.5 Enforcement Analysis

The following general enforcement comments and concerns are based on the specific alternatives in draft Amendment 13 to the Northeast Multispecies FMP. These comments have not been updated based on the proposed action to achieve rebuilding objectives. The proposed action, however, adopts many of the same measures that were considered in Alternative 1. Specific comments from enforcement on the alternatives are now annotated with the proposed action.

Closed area enforcement issues remain the same. These areas must be clearly defined with limited access to the areas in order to allow for efficient and effective offshore enforcement. Ample notice and well defined rules and restrictions must be in place for successful closed area enforcement.

Possession limits do not present any new enforcement concerns although can be manpower intensive in general. Vessels fishing in specific areas with restrictions on possession limits can be monitored more effectively though the use of VMS.

Gear restrictions are enforceable at-sea when they are clearly defined and limit the use of gear with net stowage requirements and other measures remaining in place. Gear restrictions should be written to encompass dockside enforcement.

Minimum fish size can be manpower intensive. No new enforcement concerns.

Special access programs which allow certain vessels in closed areas needs to be closely monitored. VMS would be an extremely important enforcement monitoring tool for any special access programs. The NOAA Fisheries Office for Law Enforcement (OLE) recommends the issuance of a special authorization letter that defines the requirements and restrictions for special access programs. In order to maximize enforcement, NMFS Law Enforcement suggests vessels should not be allowed to fish in any other areas while operating under a special access trip.

Area management measures also pose enforcement concerns when vessels are allowed to fish in multiple areas. NMFS Law Enforcement recommends vessels who elect to fish in a particular area, should fish in that area for the entire trip. A vessel must declare its intention to fish in a particular area prior to sailing on that trip. From the enforcement perspective, VMS would be an extremely valuable enforcement tool in any area management scheme.

Sector management poses certain enforcement and legal concerns. In general, NMFS Law Enforcement does not support sector management, however, more details are required to make an informed decision.

TAC monitoring under sector and area management alternatives requires and assumes that daily electronic dealer reporting will take place. If TACs are area specific, this proposal would require monitoring of every vessel's activity to ensure they are fishing in the specified area. To successfully accomplish the monitoring, enforcement recommends mandatory VMS on all vessels involved in this fishery.

Recreational measures need to be consistent across the board in the recreational fishery. Same bag limits/possession limits for recreational and head/charter boats.

Experimental fisheries should be limited with clearly defined restrictions and limitations that are enforceable.

DAS leasing may pose significant enforcement concerns due to the burden of administrative tracking. Program requirements must be clearly identified with an adequate administrative process in place prior to implementation.

Running clocks can only be enforced with dockside presence. NMFS Law Enforcement does not support the use of running clocks.

5.5.1 Fishery Administration

This section addresses topics material to the management of the multispecies fishery.

5.5.1.1 Fishing Year

Altering the fishing year as described in this section does not present any enforcement concerns. For purposes of enforcement, fishing years should be consistent among all fishery management plans.

The fishing year is not being changed.

5.5.1.2 DAS Pro-Ration

This alternative provides two options concerning the proration of DAS. The options focus on how DAS will be adjusted if the fishing year is changed and/or if the management measures for Amendment 13 are implemented during the ongoing fishing year. DAS proration is not an enforcement issue as currently described in this alternative and poses no new enforcement concerns. NMFS Law Enforcement strongly suggests advanced notification to industry and enforcement regarding new DAS allocations.

DAS pro-ration has not been adopted.

5.5.1.3 U.S./Canada Resource Sharing Understanding

A significant problem is that the US/CA area is around CA II, where there could be a separate TAC for these two areas. Access options, some mutually exclusive, are many and yet to be determined, including: declaration, one area versus several areas, VMS or sign-in program, DAS not counted or counted 2 for 1 or 3 for1.

It is the consensus of the Enforcement committee that VMS should be required.

The proposed action adopts A VMS requirement for fishing in the US/CA area.

5.5.1.4 Special Access Programs

This section proposes a general program which would allow fishing for a specific stock or stocks which may be permitted based on gear used, techniques, DAS adjustments, specific area(s), specific stocks or any other parameters which could be developed to allow a specific fishery.

NMFS Law Enforcement reserves comment until specific measures are identified for the special access program. The NMFS Law Enforcement issues raised in 5.5.1.4.1(Georges Bank Yellowtail Flounder Access Program), 5.5.1.5(Closed Area Administration) and 5.5.3.2.4(Gear Restrictions) would also apply to this section.

5.5.1.4.1 Georges Bank Yellowtail Flounder Access Program

This measure would allow fishing vessels to make two trips per month into a specific area of Closed Area II to fish for yellowtail flounder from June through December. Under this program vessels are restricted to 30,000 pounds of yellowtail flounder, must use VMS, do not start their DAS clock until they enter CA II unless they are fishing east of 69W on Georges Bank and are restricted to no more than one-fifth of the GB cod landing limit.

This measure is similar to the Sea Scallop Exemption Program, which allows vessels to fish in closed areas under specific conditions. Enforcement's recommendation on any consideration of allowing fishing in a closed area in the multispecies fishery should be modeled after the sea scallop exemption program. For instance, vessels would not be allowed to harvest yellowtail outside of the Exemption Area, must not enter or exit the Exemption Area more than once per trip and provide daily fishing reports through VMS. Additionally, vessels electing to fish in the Exemption Area would have a specific number of DAS subtracted from its DAS allocation. If the vessel exceeds the specific DAS, then DAS would be charged as actual time.

This scheme proposes allowing vessels to fish for other species; (i.e. GB cod) after leaving Closed Area II. Permitting vessels to fish in a closed area for a specific species, then exit the area and continue to fish for other species would poses considerable enforcement concerns. Distinguishing between fish (i.e. cod) caught in the exempted area or outside of the area is highly unlikely.

All limited access multispecies vessels intending to fish in this Exemption Program would be required to have a working VMS unit. Prior to fishing in the Exemption Program, each vessel should give advanced notification for each trip. Increasing the use of VMS would escalate enforcement resources requiring additional manpower for monitoring, system evaluation and investigative matters. As the demands and functions of VMS increase, so does the cost of the VMS unit.

The proposed action adotps a VMS requirement.

5.5.1.4.2 Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program

This alternative will allow a by-catch of 200 pounds of winter flounder while fishing for summer flounder west of 72-30W. The enforcement issues are similar to those previously described under area access programs. Enforcement of this management scheme are best achieved utilizing VMS and USCG surface patrols in conjunction with at-sea boardings. Dockside enforcement would be difficult without the usage of VMS tracking.

5.5.1.5 Closed Area Administration

Consideration of allowing additional gears into closed areas will "complicate enforcement of closed areas." Increasing the number of vessels allowed to fish in closed areas without VMS will compromise enforcement, whereas vessel identification and fishing activity will be difficult to monitor. Monitoring of the additional vessels would also expand resource needs of enforcement to effectively ensure vessels do not possess multispecies.

No changes are being made to the vessels allowed into closed areas with the exception of approved special access programs, all of which include a VMS requirement.

5.5.1.6 Leasing of DAS

This alternative proposes the leasing of DAS from one vessel to another. Allocation or DAS leasing (trading) is a current management scheme in the surf clam/ocean quahog fisheries and is authorized by NOAA/NMFS. Development of a DAS leasing alternative should incorporate the leasing/trading of allocation of the surf clam/ocean quahog system into the multispecies fishery.

Program requirements must be clearly identified with an adequate administrative process in place prior to implementation. At a bare minimum, leases would have to be arranged, documented and approved and ample notification provided to enforcement and fishermen, detailing each vessel's new DAS allocation prior to the upcoming fishing year.

5.5.1.6.1 Conservation Equivalency Alternatives

These alternatives propose varying methods of leasing and subleasing DAS between multispecies vessels. As described in these alternatives, these measures do not pose any concerns to enforcement other than, those detailed in 5.5.1.6.

5.5.1.6.2 Limitations on Number of DAS Leased

Enforcement issues regarding DAS leasing are addressed in 5.5.1.6 and are applicable to this proposal.

5.5.1.6.3 Permit History Revisions

This alternative does not present any new enforcement concerns.

5.5.1.7 Recreational Fishing Permit

This alternative proposes four options;

(1) no federal permit required
(2) possessing regulated multispecies in the EEZ requires a permit
(3) fishing for regulated multispecies in the EEZ requires a permit
(4) fishing for and possessing regulated multispecies in the EEZ requires a permit

This alternative does not present any new enforcement related concerns as currently written. Enforcement of this management scheme relies primarily on at-sea boardings. Dockside enforcement of recreational permits would be extremely difficult with out the ability to determine where the vessel had fished.

Should recreational vessel operator permits and fishing vessel trip reports be required, these provisions would require an increase in enforcement resources in order to effectively monitor the recreational fleet and the new permit requirements.

The proposed action does not adopt a recreational fishing permit.

5.5.1.8 Running Clock Alternatives

Running clocks can only be enforced via a dockside presence. NMFS Law Enforcement does not support the use of running clocks.

NMFS Law Enforcement supports the use of an “Industry funded weighmaster.”

Permitting vessels to land overages and continually altering DAS poses several enforcement concerns. Vessels participating in this program should be required to do so under an extended period of time.

The “Extended Modified Running Clock” or similar versions have not been a reliable and manageable method to determine DAS. In the past, individuals who landed overages simply called-out of the DAS program upon landing, when they believed enforcement was not around. They did not call the “cod hail line” and if gone undetected, the overage was not accounted for. This proposal is manpower intensive and enforcement is unlikely.

The proposed action does not change the modified running clock.

5.5.1.9 Observer Coverage

Increasing observer coverage does not present any specific enforcement concerns and provides additional methods of discard and by-catch reporting, as well as monitoring of fishing activity. An increase in the amount of observer coverage in other fishery management plans, has added instances requiring enforcement involvement.

5.5.1.10 Vessel Monitoring System Requirements

In conjunction with this measure**,** NMFS Law Enforcement is of the opinion that any potential cost savings may be offset by deactivation/reactivation charges by the vendor.

In an effort to maintain enforcement consistency in VMS requirements, NMFS Law Enforcement does not support allowing any VMS vessel to be at-sea without a working/active unit. NMFS Law Enforcement recommends modification of the measure to allow vessels to opt out of VMS only if the vessel is to remain in port or tied to the dock.

The proposed action does not allow a vessel to be at sea without an operable VMS. Cost savings for many vessel include not just communication costs, but the costs associated with running a generator to provide power to the VMS.

5.5.1.11 Day Gill Net Block Out of the Fishery

Removing all requirements to take blocks out of the multispecies fishery does not present any specific enforcement concerns. NMFS Law Enforcement supports this measure for purposes of decreased enforcement requirements.

The proposed action does not change the day gillnet block out requirements.

5.5.1.12 DAS Counting

This alternative does not present any new enforcement concerns. *The proposed action does not change DAS counting provisions.*

5.5.1.13 Reporting Requirements

These reporting requirements are described as "broad" alternatives and can only be addressed in a very general manner.

Daily electronic dealer reporting does not present any enforcement concerns as described in the scheme. Reporting through the DAS call-in system and a separate call-in number are addressed in 5.5.3.4.2.1and are applicable.

5.5.1.14 Open Access Hand Gear-Only Permit Alternatives

These alternatives do not pose any new enforcement related concerns.

5.5.1.15 Sector Allocation

Sector allocations are described to be an "OPTION" and voluntary. This option is designed to augment the primary overall management program selected for Amendment 13.

5.5.1.15.1 Enforcement of Sector Provisions

Under this provision, the sector "is a legal entity that can be subject to NMFS enforcement action for violations of the regulations pertaining to sectors." As written, the language regarding enforcement's role is unclear. Enforcement recommends clear concise language detailing its responsibilities concerning "violations of regulations pertaining to sectors."

From the enforcement perspective, this option is vague, convoluted and complex. Given the absence of a specific detailed plan, NMFS Law Enforcement does not support this alternative.

The proposed action adopts a sector allocation system.

5.5.1.15.1.1 VMS Requirements

There is no VMS requirement specific to this alternative; however, if other alternatives must be used in conjunction with the sector allocation alternative, then any VMS requirements under those alternatives will be imposed on the sectors. Sectors may establish their own VMS requirements as long as they remain in compliance with any other VMS requirements established by other alternatives adopted in conjunction with sector allocation.

5.5.1.15.2 Georges Bank Hook/Gillnet Sector Allocation

This alternative is voluntary and creates two distinct areas for Georges Bank cod. The sectors are split between gillnetters and hook fishermen. This measure is to be utilized in conjunction with other management measures.

5.5.1.15.2.1 GB Cod Hook Sector

Gear

Refer to enforcement concerns previously detailed in 5.5.3.1.5, these comments are applicable to the above.

Trip/Possession Limits

NMFS Law Enforcement's recommendation is to define "landing" under this section as currently stated in the regulations. Land is defined as "means to begin offloading fish, to offload fish, or enter port with fish."

Monitoring

VMS has proven to be an extremely valuable enforcement monitoring tool.

5.5.1.15.2.2 GB Cod Gillnet Sector

Gear

The USCG has commented that enforcement of gillnet limits at-sea is unlikely due to their inability to haul gear.

5.5.1.15.2.3 Hook/Gillnet sector GB Closed Area I Access Program

As with vessels authorized to fish in exempted fisheries at the present time, vessels who elect to participate in this closed area access program should be required to have a letter of authorization. Vessels should also be restricted to only fishing in the closed area during these trips. Enforcement of this program can be accomplished with VMS, USCG aerial and surface patrols along with at-sea boardings by USCG units. Dockside enforcement can be conducted in combination with VMS tracking to determine area fished.

5.5.1.15.2.4 VMS Requirements

VMS is required for both the vessels in the longline sector and the vessels in the gillnet sector, as indicated above.

5.5.1.16 GOM Inshore Conservation and Management Stewardship Plan

This area management proposal is solely for the stocks in the GOM. This option was not selected.

5.5.1.16.1.1 Management Areas

Enforcement concerns of vessels electing to fish in specific zones are addressed in 5.5.3.3.3 Movement Between Areas. Enforcement issues regarding possession limits, gear restrictions, and closed areas are discussed in 5.5.3.1.3, 5.5.3.1.4, and 5.5.3.1.5 and are applicable to these proposals.

5.5.1.16.1.2 Observer Coverage

This measure would implement 100% coverage on all mid-water trawl vessels and 20% on all multispecies vessels in the GOM. Increasing observer coverage does not present any new specific enforcement concerns and provides additional methods of discard and by-catch reporting, as well as monitoring of fishing activity. Consequently, NMFS Law Enforcement recognizes that any increase in the amount of observer coverage will also result in increased referrals requiring enforcement involvement.

5.5.2 Alternatives to Control Capacity

5.5.2.1 Capacity Committee Alternatives

As currently described, this alternative poses no new enforcement concerns.

5.5.3 Management Alternatives to Address Rebuilding Requirements

These specific alternatives were not adopted. Many of the provisions, however, have been incoporated into the proposed action..

5.5.3.1 Alternative 1 – Up to 65% Reduction in Used DAS

This alternative was not selected, but many of the measures in this alternative are part of the proposed action.

5.5.3.1.1 Effort Controls

5.5.3.1.2 DAS Restrictions

This option may require vessels fishing in SNE and MA regulated mesh areas to be charged DAS at a 1.5:1 rate. The proposal would require monitoring of each vessel's activity to accurately document their time in the aforementioned areas. From NMFS Law Enforcement's perspective, the only effective manner to accurately document the DAS ratios associated with this alternative would require mandatory VMS on all vessels fishing in these areas. Consequently, increasing the number of participants into the VMS system would require additional enforcement resources for monitoring and investigative inquiries due to the increased vessel monitoring load.

Utilization of the DAS call-in system to document time spent in specific areas would be considerably less enforceable, whereas there is no discernable method to document how long a vessel was in the area.

The proposed action adopts differential DAS counting in the SNE/MA RMA in future years.

5.5.3.1.3 Closed Areas

Year-Round Closed Areas and Seasonal Closed Areas

NMFS Law Enforcement's general guidance concerning implementation of closed area management is consistent for all management plans and is based in the "Precepts for Efficient Fisheries Enforcement". This alternative proposes two types of areas (closed and rolling). As identified in our Precepts, enforcement of closed areas is enhanced when the areas are "plain-shaped and clearly defined", straight lines on a straight north/south or east/west axis and their status (open, closed, open to some vessels) is maintained for reasonably long periods of time.

It is suggested that closed areas should be designed with a surrounding buffer to prevent brief incursions into the protected area. Use of VMS to enforce closed areas is less effective whereas VMS is voluntary for limited access multispecies vessels. Mandatory VMS on all multispecies vessels would greatly enhance enforcement's ability to track vessels and determine any closed area incursions. Enforcement of closed areas can be conducted with aerial and surface patrols and at-sea boarding by USCG units.

5.5.3.1.4 Possession Limits

Vessels restricted to possession limits while fishing in specific areas can be enforced by VMS and USCG enforcement through aerial and surface patrols in combination with at-sea boardings.

5.5.3.1.5 Gear restrictions

As with the current gear restrictions, enforcement relies on at-sea boardings to measure compliance. Enforcement of at-sea gill net limits is difficult to enforce, whereas the USCG has indicated they do not have the ability to haul gear.

Under this measure, large mesh vessels are restricted to certain mesh sizes based solely on the area fished. VMS is an extremely valuable enforcement monitoring tool and would increase the ability to determine areas fished by vessels with both mesh and landing limit restrictions.

Also under this alternative, long line vessels would be allowed to fish with no more than 4,500 12/0 hooks. From an enforcement perspective, this limitation on the number of hooks in use is virtually unenforceable. Additionally, the 12/0 size hook needs to be defined whereas the 12/0 hook is sold by several different companies and differ in size. NMFS Law Enforcement recommends identification and comparison by each manufacturer as to their 12/0 hook standard.

5.5.3.1.6 Minimum Fish sizes

Minimum fish sizes as described in the settlement agreement will continue to be in effect. The minimum fish sizes do not present any new enforcement concerns.

5.5.3.1.7 VMS Requirements

There is no VMS requirement automatically implemented by this alternative. The current call-in system and voluntary VMS will be maintained.

The only effective manner to accurately document the DAS ratios associated with this alternative would require mandatory VMS on all vessels fishing in these areas. Likewise, VMS is an extremely valuable enforcement monitoring tool and would increase the ability to determine areas fished by vessels with both mesh and landing limit restrictions.

5.5.3.2 Alternative 2 - Reduction in Allocated DAS/Gear Modifications

This alternative was not selected.

5.5.3.2.1 Effort Controls

Option 1

This option reduces allocated DAS by 30% for all vessels fishing in the GOM MA. All vessels intending to fish in the GOM must declare into the fishery for a minimum of 30 days. If the TAC is not met at the end of third quarter of the fishing year, the vessels revert back to the allocated DAS initially implemented on August 1, 2002 (20%).

From an enforcement perspective, the most effective method to track each vessel's location is to require the installation of VMS on each vessel fishing in the GOM. Since vessels allocated DAS are limited to 30% less while fishing in the GOM, the most feasible method to keep track is through the use of VMS. Without VMS, vessels electing to fish in the GOM could do so without the knowledge of the NMFS, thereby circumventing the reduction in DAS.

Another enforcement issue concerns the notification process. There must be timely notice to fishermen regarding the GOM cod landings exceeding or not surpassing 75 % of the TAC at the end of the third quarter.

Option 2
Option 2 differs from Option 1 in that a vessel is limited to using no more than 70% of its allocated DAS while fishing in the GOM MA. If vessels intend to fish in the GOM they must enroll for a minimum of 30 days and all DAS used will be charged against the GOM limit.

NMFS Law Enforcement's comments described in Option 1, above, would also apply to this option.

5.5.3.2.2 Closed Areas

NMFS Law Enforcement's recommendation concerning closed area management measures is documented in our "Precepts for Efficient Fisheries Enforcement". In addition to the issues raised in 5.5.3.1.3, NMFS Law Enforcement suggests fisherman and enforcement are given appropriate notification regarding the closure of specific areas.

5.5.3.2.3 Possession Limits

This measure proposes to reduce the daily/trip limit if 75% of the GB cod or haddock TAC is harvested. The only enforcement concern is proper advanced notification to all fisherman and enforcement of the change to the possession limit.

This measure also proposes trip limits for Cape Cod yellowtail while fishing in statistical areas 514 and 521 or in certain thirty minute squares in the inshore GOM. Vessels should be required to declare into this fishery and would be limited to the aforementioned trip limit while enrolled. Therefore vessels choosing to fish outside of this area while enrolled would still be subject to the 50/lb trip limit. Possession limits while fishing in specific areas are more readily enforced by VMS and USCG aerial and surface platforms, as well as at-sea boardings by USCG units. Dockside enforcement can only be conducted if the vessels are enrolled to fish in the above referenced statistical areas and are limited to 50 lbs of yellowtail per trip, regardless of the area fished

5.5.3.2.4 Gear Restrictions

Georges Bank and Gulf of Maine
This measure requires the mandatory use of separator trawl net and/ or a flounder net. A flounder net is not defined in current regulations, but this Amendment proposes the following definition: "a flounder net is defined as a two-seam low-rise groundfish net." It is still unclear what a low-rise net is fro this definition. For example, would low-rise be less than some height, the distance between top and bottom, etc.

Further, a separator trawl is defined as:

> A separator trawl is defined as a groundfish trawl modified to a vertically-oriented trouser trawl configuration, with two codends arranged one above the other. The bottom cod end is left open. A horizontally oriented large mesh (6 ½ inch square mesh minimum) separating panel is installed between the selvedges joining the upper and lower panels, extending from the front of the trouser junction forwards to the aft section of the first belly behind the fishing circle.

Trip and Day gillnet vessels are restricted to the number of nets they can possess, fish, haul or deploy. Establishing restrictions on "no tie-down gillnets" can only be enforced with at-sea boardings.

Also proposed in this measure is the requirement of all multispecies permitted vessels to use 12/0 hooks while fishing with long line gear. 12/0 hooks must be clearly defined as this size hook differs from company to company. NMFS Law Enforcement recommends a comparison by each manufacturer as to acceptable standard. Without a concise definition, this limitation on the number of hooks in use is virtually unenforceable.

The USCG has indicated at-sea enforcement of gillnet and hook limits at-sea are unlikely because of there inability to haul gear.

Gulf of Maine

Specifically in the GOM, trawl gear used inshore of 70 W must be a separator trawl net and/or flounder net, trawl gear would be restricted to the Raised footrope trawl in blocks 114,115,123,124 and 125, no-tie down gillnets in blocks 114, 115, 123, 124 and 125 and 10 inch twine top for scallop dredges while fishing in blocks 114, 115, 123, 124, and 125. Gear requirements should be uniform regardless of the area fished. Gear restrictions in specific areas are more readily enforced if vessels are restricted to possessing only the gear type described in this management measure. Vessels fishing in gear restricted and non restricted areas during the same trip and possessing different gear types would be very difficult to catch and require more enforcement manpower. Enforcement of these measures would only be conducted through at-sea boardings. Effective enforcement is improbable under this measure.

5.5.3.2.5 VMS Requirements

VMS is required for all vessels that fish in both the Gulf of Maine and Georges Bank. It is unclear whether this means only those fishing in both areas, and vessels fishing in either GOM or GB are not required to use VMS, or not.

From an enforcement perspective, the most effective method to track each vessel's location is to require the installation of VMS, on each vessel, fishing in the GOM. Possession limits while fishing in specific areas are more readily enforced by VMS and USCG aerial and surface platforms, as well as at-sea boardings by USCG units.

5.5.3.3 Alternative 3 - Area Management

This alternative was not selected.

5.5.3.3.1 Calculation of TACs

These two options determine the how the TACs will be identified for six different management areas. Enforcement does not have any specific concerns regarding which option is used to establish the TACs.

5.5.3.3.2 Consequences for Exceeding TACs

No new specific enforcement concerns.

5.5.3.3.3 Movement Between Areas

This measure describes five options allowing vessels to fish and move into one or more management areas at any time, during a trip, a different area on each trip, or one area during the entire fishing year.

Using the DAS call-in system to elect an area fishers intend to fish while at-sea or before leaving the dock would dramatically increase the need for at-sea enforcement presence to determine the specific area(s) fished. Although Options one, two and three requires vessels to be held to the more restrictive trip limit if they fish in more than one area, using the call-in system can not ensure enforcement's ability to determine any of the areas fished, except as reported by the vessel. Monitoring of hundreds of multispecies permitted vessels would be conducted through USCG aerial and surface patrols in conjunction with at-sea boardings by USCG units. Dockside enforcement would not be possible without the use of VMS.

(The use of the DAS call-in system for these proposals would increase resource needs by enforcement in order to determine if this system could be utilized effectively to track movement between areas. Modifying the current DAS call-in system would require reprogramming and script changes at additional costs.) Option one and two also require using Vessel Trip Reports in conjunction with the DAS call-in system to evaluate the management measures for each area. Enforcement's concern is raised with the use of VTRs as a management measure. Enforcement has encountered numerous instances where individuals have submitted inaccurate and incomplete VTRs, as well as not submitting them at all. Often times VTRs are submitted in an untimely fashion.

Under Option four vessels may fish in one area per trip, however if they choose to fish in more than one area during the fishing year, they are required to install a Vessel Monitoring System. VMS is a valuable enforcement tool in identifying each vessels location. Vessels that are not required to have a VMS will be able to enter different management areas without the knowledge of enforcement.

Option five limits vessels to fishing only one management area per fishing year. Enforcement's concern is with vessels limited to fishing in a specific area, and is addressed in the other four options above.

Enforcement recommends any vessel electing to fish in any area should be required to enroll with a letter of authorization indicating the area(s) to be fished. Each vessel must fish in the selected area for a minimum period of time.

Use of VMS for all involved vessels would enhance enforceability of unauthorized fishing in management areas and aid in the enforcement of species quotas trip limits.

An increase in observer coverage would assist in monitoring both discards and fishing activity, whereas the TAC management scheme mandates accurate and dependable reporting.

5.5.3.3.4 VMS Requirements

VMS is required for all vessels moving between areas within a single trip. This applies to movement between areas options 1-4 but not option 5.

Determining the location of hundreds of vessels could only be enforced through the use of VMS. Use of VMS for all involved vessels would enhance enforceability of unauthorized fishing in management areas and aid in the enforcement of species quotas trip limits.

5.5.3.4 Alternative 4 - "Hard" Total Allowable Catch (TAC)

This alternative will develop TACs for "all stocks in the multispecies FMP on a single or multi-stock basis". A TAC may be designed for the recreational fishery and if one is developed, it will be observed independently from the commercial TAC. *This alternative was not selected.*

5.5.3.4.1 Hard TAC with Input Controls

This management measure incorporates a hard TAC with input controls. The term "input controls" should be clearly defined to identify which management measures they incorporate. The input controls as described in this alternative are derived from one of three options:

<u>Option 1</u>
The input controls in option 1 are the management measures outlined in Alternative 2 (5.5.3.2- Reduction in Allocated DAS/Gear Modifications). The enforcement issues are outlined in Alternative 2 and are the same for this option.

<u>Options 2 and 3</u>
Option 2 is based on the measures implemented by the Framework 33 court order effective April 30, 2004. In other words option 2 is the management measures currently in place. Option 3 is the management schemes implemented during the 2001 fishing year. Option 3 is also described as the No Action Alternative.

Option 2 and option 3 are very comprehensive management schemes. Enforcement reiterates it's recommendations outlined in the "Precepts for Efficient Fisheries Enforcement".

NMFS Law Enforcement does not foresee any new enforcement related concerns associated with this measure. NMFS Law Enforcement recommends review of previous enforcement comments relating to VMS, closed areas, Days-at-Sea, trip limits, possession limits, special access programs, and gear restrictions.

5.5.3.4.2 Monitoring the TAC

This measure requires up to date information to NMFS in order to accurately manage the TACs. Increased reporting (real time) of catches will be necessary as the TAC becomes closer to being fulfilled. Successful implementation of this management plan will require comprehensive monitoring, and as part of the monitoring system, enforcement recommends increasing observer coverage to monitor fishing activity.

5.5.3.4.2.1 Reporting System Options

The concept of "daily electronic dealer reporting" is supported by enforcement. At this time, this alternative does not identify the details regarding electronic dealer reporting and a vessel's trip identifier number. NMFS Law Enforcement's general concern regarding reporting is accountability and veracity of the reports and ensuring that these issues are sufficiently addressed.

Under option one, two and three dealer reporting will be accomplished by way of electronic reporting. Also under option one all limited access multispecies vessels will be required to have a VMS system and use this system to report the area they intend to fish. Vessels who have been issued a small vessel permit and open access vessels will be able to report utilizing a call-in number. Option two and three do not insist on VMS for limited access multispecies vessels and rely on call-in systems for all vessels.

Mandatory VMS for all limited access DAS multispecies vessels is supported by enforcement. Determining vessel incursions into areas which may be closed or have stock restrictions can be accomplished through the use of VMS and to a lesser extent at-sea enforcement. Determining where a vessel has fished is unlikely through dockside enforcement.

The expansion of VMS to hundreds of vessels would likely increase resource needs of enforcement to effectively oversee the administrative tasks and monitoring of escalated VMS usage.

Establishing a call-in number for "small vessel permit category and open access vessels" to report specific information would expand resource needs by enforcement and require implementation of infrastructure and administrative processes set up to collect, extract, and break down the information. The cod hail line was a variation of this call-in number and was set up for fishermen to report information regarding their cod landings. Very few fishermen called the cod hail line, and from the enforcement perspective, was an unsatisfactory mechanism to document the required information.

Enforcement concerns requiring fishermen to identify area fished through the DAS call-in system have been raised in 5.5.3.3.3 and are applicable under this option.

5.5.3.4.2.2 VMS Requirements

VMS is required for all vessels in Option 1 only. There are no VMS requirements for Options 2 and 3.

Mandatory VMS for all limited access DAS multispecies vessels is supported by enforcement. Determining vessel incursions into areas which may be closed or have stock restrictions can be accomplished through the use of VMS and to a lesser extent at-sea enforcement. Determining where a vessel has fished is unlikely through dockside enforcement.

5.5.3.4.2.3 Reaching the Total TAC

This management measure has two options:

Option 1- Closure of Stock Area

Under this proposal, the NMFS would close a particular area or entire statistical area(s) to gear capable of catching a particular species, if all of the TAC for that stock is projected to be caught. However, fishing gear believed to be incapable of catching the species for which the TAC would be reached, will still be able to fish in the closed area(s).

With area specific TACs, there will be an increased emphasis on enforcement of closed areas, possession limits, vessel inspections at sea (to determine gear used and retention of prohibited species), and accurate and timely reporting.

NMFS Law Enforcement strongly suggests that closed areas should be clearly defined in large, plain shapes and maintained for sensibly long periods of time. Multiple possession limits for various stocks in different areas will be difficult to enforce, particularly without ubiquitous VMS coverage. Use of VMS for all limited access multispecies vessels would greatly enhance enforceability of closed areas regardless of the reason for the closure. *See comments in 5.5.3.1.3 with regards to VMS and closed area enforcement and 5.5.1.5 concerning closed area administration.*

Possession limits can be monitored via dockside enforcement, however, enforcement would be limited without the ability to determine the specific area where the fish were caught. See comments in 5.5.3.1.4 with regards to possession limit enforcement.

To effectively monitor and report the catch in these TAC management areas this alternative may require an increase in observer coverage. The enforcement concerns related to increased observer coverage are addressed in 5.5.1.16.1.2. and 5.5.3.4.2.

Option 2 - Prohibition on Retention

Under this alternative, possession of a species is prohibited in an area for which all of the TAC for a specific stock is projected to be harvested, except for transiting purposes. If the vessel possesses the same species harvested from other stock areas, this alternative allows the vessel to transit the closed area as long as the gear is stowed appropriately and prohibits the vessel from fishing in the closed area.

NMFS Law Enforcement is concerned that this scheme would allow vessels to fish in the closed stock area with gear capable of catching the prohibited species and then move to other stock areas and catch the same species. Enforcement of the closed stock areas would be most effective through VMS, however, VMS can not identify where the closed species were caught. Vessels allowed to fish in closed stock areas with gear capable of catching closed stocks would require at-sea or aerial patrol units to enforce the closed areas.

As previously identified, multiple possession limits for various stocks in different areas along with transiting in closed stock areas while possessing prohibited stocks pose significant enforceability concerns.

With regards to both Option 1 and Option 2, NMFS Law Enforcement suggests appropriate advanced notification to industry and enforcement regarding any upcoming closed stock areas.

5.5.3.5 Recreational Fishing Measures

The minimum size and bag limits listed under the recreational fishing measures do not present any new enforcement issues.

Option 3 states "any trip in excess of 15 hours and covering two consecutive calendar days will be considered more than one day." Enforcement of this option with out being able to verify period of time fished would be difficult and extremely resource intensive.

Option 3 is part of the proposed action. Vessels subject to this restriction are required to file VTRs recording time of sailing and the end of the trip.

5.5.4 Alternatives to Minimize the Adverse Effects of Fishing on Habitat

Alternative 2 – Complementary Benefits of Other Amendment 13 Alternatives *(Preferred Alternative)*
See the other alternatives.

Alternative 3 – Habitat Closed Areas
Enforcement recommends following the guidance provided in the "Precepts for Efficient Fisheries Enforcement". Closed Areas that are clearly defined in large, plain shapes for reasonably long time spans with minimal exceptions, exemptions or transiting provisions (except for compelling safety reasons). Again, use of VMS for all involved vessels would enhance enforceability of the closed area regardless of the reason for the closure. Increased use of VMS would, in all cases, require additional enforcement resources for monitoring as well as verification that the system is prepared to handle the increased vessel monitoring load.

Alternative 4 – Modified Groundfish closed areas with habitat subsets identified
This alternative would create "blocks", "each approximately 75 square nautical miles in size, by the existing grid of latitude and longitude lines at 10 minute intervals." The blocks would be further grouped into five areas (Gulf of Maine, Georges Bank, South Channel, Hudson Canyon, Southern). Closures would be applied to these areas in various ways by this alternative. From the enforcement perspective, the discussion of possible scenarios of closed and open areas created by this alternative seems fairly complicated. We again recommend a simple, long term closure practice whenever possible.

This alternative was not selected.

Alternative 5 - Closed areas designed to protect important EFH and balance fishery productivity*)*
Enforcement recommends following the guidance provided in the "Precepts for Efficient Fisheries Enforcement". Alternatives 5A, 5B, and 5C show narrow, fishable corridors between two closed areas. Alternative 5D is preferred because it has the shortest corridor, but enforcement would prefer no narrow corridors at all. Again, use of VMS for all involved vessels would enhance enforceability of the closed area regardless of the reason for the closure.

This alternative was not selected.

Alternative 6 - Closed areas consistent with the Framework Adjustment 13 Scallop Closed Areas Access Program *(Preferred Alternative)*
The shapes/sizes of some of the areas designed off of the New England coast (such as CAI and NLCA) do not meet the general enforcement recommendation of large, plain shaped. Larger areas with straight line boundaries and the ability to provide a buffer between the area boundary and the stocks would enhance enforceability of this alternative.

This alternative was not selected.

Alternative 7 – Expand the list of gears prohibited in closed areas
Echoing the general enforcement comments on page 5, with respect to closed area enforcement, areas must be clearly defined with limited access to the areas in order to allow for efficient and effective offshore enforcement. Expanding the list of gears prohibited in year-round closed areas will further limit access, thus making offshore enforcement more efficient and effective. Transit rules are necessary, particularly for pots

and traps.

This alternative was selected, but only hydraulic clam dredges were added to the list of prohibited gear.

Alternative 8 – Restrictions on the use or rockhopper gear and/or roller gear *(Preferred Alternative)*
Like the proposed scallop restriction on rock chains, region wide (i.e., throughout the entire range of the multispecies fishery) restrictions on rockhopper and roller gear do not pose any significant enforcement related concerns. Any gear restrictions *by area* do pose enforcement concerns similar to the general enforcement comments on area management measures (page 6). As with other gear restrictions, this alternative would rely on at-sea boardings.

Additionally, clear and concise definitions of 'rockhopper' and 'roller' gear, and stowage rules, are necessary.

This alternative was not selected.

Alternative 9 – VMS on all groundfish vessels
One of the Enforcement Precepts is 'Assisted by VMS'. Vessel Monitoring Systems are a tremendous asset to enforcement for monitoring days at sea as well as closed areas. Additionally, the knowledge of the whereabouts of fishing vessels eases the logistical burdens of extensive surveillance, which can be extremely manpower intensive. When developing new management plans consideration should be given to requiring implementation of VMS on vessels. This alternative does just that.

This alternative was not selected.

Alternative 10 – Habitat Closed Areas the are modifications of existing mortality closures and other proposed habitat closures *(Preferred Alternative)*
Alternative 10A modifies the borders of existing closed areas, or areas proposed for closure under the other alternatives. Alternative 10B is actually the same as scallop habitat alternative 8b; thus, a larger area is preferable to a small area, and an area with fewer edges is preferable to one with lots of edges. All other general enforcement comments relative to all gears being prohibited, VMS requirements, stowage and transit, apply.

This alternative was selected.

5.5.5 Other Issues

5.5.5.1 Northern Shrimp Fishery Exemption
This alternative does not pose any new enforcement related concerns.

5.5.5.2 Tuna Purse Seine Vessel Access to Groundfish Closed Areas
This alternative does not pose any new enforcement related concerns, other than those described in 3.4.7.

5.5.5.3 SNE General Category Scallop Vessel Exemption Program.
This alternative does not pose any new enforcement related concerns.

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5.6 Social Impact Analysis

5.6.1 Social and Community Impacts

5.6.1.1 Introduction and Background

This social impact assessment characterizes the magnitude and extent of the social impacts likely to result from the alternatives considered in Amendment 13 to the Northeast Multispecies FMP as compared to the no action alternative. To the extent possible, the following assessment provides a comparison of alternatives under consideration to support the Council's decision-making process.

This assessment was prepared in accordance with NEPA and the Magnuson-Stevens Fishery Conservation and Management Act, as well as other applicable laws. NEPA requires that economic and social impacts of regulatory actions be considered and evaluated through a decision-making process that involves the public. National Standard 8 of the Magnuson-Stevens Act states that:

> Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

It is important to note that the current interpretation of National Standard 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. *Sustained participation* is interpreted as continued access to the fishery within the constraints of the condition of the resource. The long-term conservation and rebuilding of stocks often require that limits be placed on particular gears and/or the harvest of specific stocks. Thus, the law interprets National Standard 8 only as a consideration of continued overall access to fishery resources and not as a guarantee that fishermen will be able to use a particular gear type, harvest a particular species of fish, fish in a particular area, or fish during a certain time of the year.

A fundamental difficulty exists in attributing social change to specific factors such as management regulations when communities or other societal groups are constantly evolving in response to numerous additional external factors, such as market conditions and technology. Increasingly important influences in coastal communities include demands for recreational uses of the waterfront and tourism (these influences are referred to as *gentrification* in the MARFIN Report). Certainly, management regulations influence the direction and magnitude of social change, but attribution is difficult with the tools and data available. Attribution is particularly difficult considering the dynamic and fluid nature of fishing communities. As a result, while this assessment focuses generally on the social impacts of the proposed fishing regulations, it is recognized that external factors are also influencing change, both positive and negative, in the affected communities. In many cases, these factors contribute to a community's *vulnerability* and ability to adapt to new or different fishing regulations.

5.6.1.1.1 Scale of Assessment – Fishing Communities

Section 316 of Magnuson-Stevens Act defines a fishing community as:

> a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community.

As discussed in the Affected Human Environment (section 9.4), there are a number of issues involved in whether a port meets National Standard 8's legal definition of a fishing community. But fishery impact statements, such as the social impact analysis, must examine the impacts to all the participants, including all communities and other groups that participate in the fishery. Thus for the purposes of this social and community impact assessment, the primary and secondary port groups identified and described in the Affected Human Environment (section 9.4.5) will serve as the primary scale of measurement. ***Primary groups*** are those communities that are currently most substantially engaged in the groundfish fishery (see the Affected Human Environment for a discussion of the distinction between substantially engaged and substantially dependent in National Standard 8). For the most part, primary groups are fishing communities that are likely to be the most significantly and directly impacted by Amendment 13 management measures, and the analysis of impacts on them speaks to the analytical requirements of National Standard 8. However, the impacts of Amendment 13 are predicted to be large in scale, affecting most ports engaged in the groundfish fishery. This assessment, therefore, has sought to gain a wide perspective on the magnitude and extent of the impacts of the alternatives under consideration. Thus the analysis also considers ***Secondary groups***, which are those ports that currently may not be substantially involved in or dependent on the groundfish fishery but have demonstrated some participation in the groundfish fishery since the 1994 fishing year (FY94). They also may consist of places that were historically more involved in the groundfish fishery, but are not recently for many reasons (loss of nearshore fishery, concentration of fishery in larger ports, external factors, etc.).

Current guidance on National Standard 8 defines a community as a town or city, a geographic unit which might fit the Census Bureau's definition of a "place." But it is important to note that fishing communities are not bounded or separated from the commerce and institutional apparatus of the larger cities and towns in which they are located. In fact, most fishing communities rely on a rather complicated network of business and social ties that extend well beyond their geographic boundaries and often into other communities in the region. The grouping of communities in this assessment and the socioeconomic context provided by the IMPLAN model allows for some consideration of the interconnected nature of ports and communities when predicting the impacts of Amendment 13. Moreover, because the size and diversity of the groundfish fishery makes it impractical to consider impacts on each secondary port individually, their grouping with other secondary ports in the same county or geographically adjacent counties has been done consistently with the regions analyzed using the IMPLAN model (see section 5.4.6), so that it can be used to better characterize the impacts on these community groups.

When predicting social impacts of management measures, it is important to consider impacts on the following, which will be discussed to the extent possible in the following sections:

- the fishing fleet (vessels grouped by fishery, primary gear type, and/or size);
- boat owners and captains;
- crew;
- fish buyers (dealers);
- seafood markets;
- community cooperatives;
- fishing industry associations;
- cultural components of the community;
- fishing families.

5.6.1.2 SIA Information Sources

An updated and comprehensive description of the affected human environment (multispecies fishermen and fishing communities) is presented in section 9.4. Additional fishery and community information as well as an assessment of the social impacts of the multispecies rebuilding program are presented in Amendments 5, 7, and 9 to the Northeast Multispecies FMP. Frameworks 25, 26, 27, 30, 31, and 33 also contain useful information on affected fishing vessels and communities as well as predictions about the social impacts of recent groundfish management measures. The information in these documents supplements this social impact assessment and provides background information to help assess the impacts of the Amendment 13 management alternatives.

New information is available for use in assessing the social and community impacts of the Amendment 13 alternatives. Recent studies, inventories, and other important publications containing social, economic, and community information are summarized in section 9.4.5. New information includes the recently-published MARFIN Report, other community profiles, the ME DMR Groundfish Regulation Impact Survey, and Council staff initiatives including the Social Impact Informational Meeting Report. While it is not practical to include all of the information in this document, readers and reviewers should reference these additional sources of information to gain a more complete perspective on the issues. Where appropriate, key findings and important information from these documents are summarized to support the conclusions drawn in this impact assessment. These additional materials can be obtained by contacting the Council office. The Social Impact Informational Meeting Report serves as Appendix I to the document.

5.6.1.2.1 Background

Amendment 7

This EIS is the first since Amendment 7 to the Northeast Multispecies FMP in 1996 (Framework 36 was never submitted). Amendment 7 was the most comprehensive program in a ten-year long sequence of management actions designed to rebuild and manage the Northeast multispecies fishery. It built on the management system implemented in Amendment 5 with controls on the number and size of vessels that may fish for regulated multispecies, the number of days-at-sea a vessel may fish for those species, and the size of the fish that can be caught. Specifically, Amendment 7 contained the following measures:

- modifications to the limited access and open access permit categories in the permit moratorium;
- target Total Allowable Catch (TAC) levels to provide a basis for evaluating the effectiveness of the rebuilding program;
- continuation of Regulated Large Mesh Areas (minimum mesh size for **all** fishing activities);
- a certification process for fisheries using mesh smaller than the minimum mesh with less than 5% regulated species bycatch;
- adjustments to the Days-At-Sea (DAS) Effort Reduction Program (an accelerated timeline for reducing available DAS);
- gear restrictions (minimum mesh size, restrictions on the number of nets);
- year-round and seasonal area closures;
- possession limits for some stocks (for example, the haddock possession limit was 1,000 pounds);
- additions to the measures that can be implemented through the framework adjustment process; and
- mandatory data reporting requirements for vessel operators and dealers.

When the Council implemented the multispecies stock rebuilding program in Amendment 7, it recognized that the measures required to achieve the plan objectives would have significant social and community impacts. It stated that the breadth and scope of those measures would likely cause social change proportional to the individual or community dependence on the affected stocks. The Council also noted that the social impacts of the management measures are largely related to their economic impacts, and as such would be severely negative in the short-term and positive in the long-term, although some fundamental changes would occur for which a value cannot be assessed.

The "Social Impacts" section of Amendment 7 was framed by six guiding precepts:

- Will standards, style, or pace of living change?
- Will cooperation and interaction patterns change?
- Will change be sudden or gradual?
- How does the proposed action fit with historical trends and participation in the fishery?
- Does the change fit with cultural or normative expectations of behavior in the fishery or community?
- How do fishermen and the community members view the alternatives?

Significant social impacts predicted in Amendment 7 are summarized below, categorized by the management measure they were associated with in the analysis.

Modifications to limited access and open access categories: Amendment 7 proposed modifications to the previously instituted permit moratorium, including the elimination of two open access categories (possession-limit-only and hook-gear-only); transfer of vessels permitted in these categories to similar, limited access categories; creation of one additional small-scale or subsistence open access category (handline/rod-and-reel); and creation of a charter/party permit class. The social impacts of these permit modifications as predicted by Amendment 7 were mixed. For example, some open access permit holders would likely not qualify for limited access permits in the short-term, resulting in a potential loss of revenues; however, creation of the handline/rod-and-reel category (with its accompanying 300-pound trip limit) was seen as a way to mitigate the resulting impacts of this by not completely shutting out the previously open-access fleet. An additional positive impact associated with the modifications was the potential incentive they would provide for smaller vessels to remain flexible in gears used and species fished, which could help compensate for a projected loss of revenues from groundfish harvesting.

Implementation of target Total Allowable Catch (TAC) levels to provide an evaluative basis for rebuilding efforts: The potential social impacts of this management decision as outlined in Amendment 7 were all positive in nature. Amendment 7 characterized target TAC levels as tools for assuring long-term compliance with rebuilding goals and considered important for rebuilding the resource and the fishery in its entirety.

Certification of bycatch fisheries: This provision of Amendment 7 outlined a certification process for the exemption of certain fisheries using mesh smaller than the minimum standard, but with less than 5% regulated species (groundfish) bycatch. Predicted impacts of this measure were again largely characterized as positive, by providing fishermen options for diversification into other fisheries (dogfish, silver hake, herring, fisheries west of 72°30').

Accelerated effort reduction program (Days-at-Sea): This proposed action reduced Days-At-Sea (DAS) for affected vessels at an accelerated rate of 50% over two years, while simultaneously adding hook and gillnet vessels to the DAS requirements. Amendment 7 clearly anticipated significant social impacts resulting from these enhanced reductions in allowable groundfish DAS, primarily that some vessels, particularly those already in a financially uncertain position, would not be able to survive the reductions. The amendment supported this assessment with a presentation of the findings of an analysis that evaluated the "break-even" (operating costs equal to revenues) levels of DAS for a variety of vessel types and ports of landing. The analysis predicted a significant failure of both large and small vessels across ports, particularly in Year 2 of the program which would see allowable DAS reduced to 88 for Fleet DAS vessels and by 50% for Individual DAS vessels. Another predicted impact arising from DAS reductions was an increase in conflict in inshore fisheries between vessels fishing with different gear types, driven to those fisheries by the desire to avoid losing DAS to steaming time.

Gear Restrictions: Both minimum mesh sizes and square mesh requirements were unchanged by Amendment 7; minimal impacts were predicted for gillnetters, as the majority of gillnet vessels were already operating with mesh larger than that required by existing regulatory minimums at the time Amendment 7 was implemented.

Area Closures: Closed Areas I and II and the Nantucket Lightship Area would remain closed on a year-round basis as earlier mandated by Framework Adjustment 9, generating a prediction of no additional impacts.

A process for establishing seasonal spawning closures was provided for in Amendment 7, but impacts were considered beyond the scope of the Amendment's analysis prior to specification of the specific closure area(s). The amendment did note that large area closures lead to crowding of the remaining fishing grounds and conflicts between those fishing with different gear types. It also briefly discussed the possible impacts on family and social cohesion from disruption of the traditional routine of fishermen, and from the possibility that small-vessel fishermen could be converted to laboring on larger vessels, with accompanying longer hours at sea.

Possession Limits: The decision to raise the possession limit for haddock from 500 to 1,000 pounds was seen as having a substantial positive impact on large otter trawls operating from Gloucester, New Bedford, and Portland. This impact was largely characterized in the amendment as an opportunity for large vessels landing haddock at these ports to increase revenues generated by haddock, particularly as a proportion of all revenues received from groundfish harvesting.

Mandatory Data Reporting: Amendment 7 categorizes the Northeast groundfish fishery as heterogeneous and highly competitive, which therefore heightens the importance of monitoring and data reporting by vessel operators and dealers to successful management of the resource. This provision was added as a means of assessing actual activity and ensuring that enforcement actions are taken when the requirements of the FMP are violated. One positive social impact implied here is a reduction in perceptions among fishermen that voluntary compliance with regulations puts them at a disadvantage to other resource users who do not similarly comply.

Framework Adjustments: The amendment states that "leaving open the possibility of adjusting any measures, as needed, to meet rebuilding goals greatly increases the long-term effectiveness of this amendment." The perceived flexibility associated with adjustments – particularly in the case of the DAS limitations – is projected as something which ultimately will benefit the entire fishing industry by allowing the Council to respond to updated information about the evolving condition of the stocks.

A complete discussion of the social and community impacts predicted from the Amendment 7 management measures can be found in the Amendment 7 EIS.

Cumulative Impacts

Much has happened in New England fisheries management since the implementation of Amendment 7. The Magnuson-Stevens Act was reauthorized in 1996, and the SFA amendments to the MSFCMA added three new National Standards, including one relating to fishing communities, safety at sea, and bycatch. The reauthorized MSFCMA also emphasized the need to conserve and manage fisheries resources and rebuild each stock to levels that can sustain MSY on a long-term basis. The New England Council has responded to the requirements of the new law with modifications to groundfish regulations almost on an annual basis since Amendment 7 was implemented.

The Council's response to the mandates of the MSFCMA has resulted in the implementation of management measures through the framework adjustment process, the impacts of some of which were not fully considered or predicted in Amendment 7. Framework 25 was considered a multispecies annual adjustment but was actually the first in a series of framework adjustments implemented to address concerns about Gulf of Maine cod (Frameworks 20 and 24 also included measures to reduce fishing mortality on Gulf of Maine cod, but they were not as comprehensive as the effort that was initiated with Framework 25).

Framework 25 became effective at the beginning of the 1998 fishing year (May 1, 1998). The purpose of Framework 25 was to significantly reduce fishing effort on Gulf of Maine cod through a combination of direct and indirect measures. Direct measures included area closures and Gulf of Maine cod trip limits, and indirect measures included an incentive for vessels to shift fishing effort from the Gulf of Maine to Georges Bank with an increase in the Georges Bank haddock trip limit. Since Framework 25 and over the past 3-1/2 years, ten additional framework adjustments have been implemented, and all but three included measures to protect and rebuild Gulf of Maine cod (two were for whiting management, and one addressed marine mammal issues).

One example of social impacts that were not predicted in Amendment 7 is what resulted from increased regulatory discarding of Gulf of Maine cod due to low trip limits. When Amendment 7 was implemented, there was no Gulf of Maine cod trip limit, nor were there any proposals in Amendment 7 to establish a trip limit for Gulf of Maine cod. The first Gulf of Maine cod trip limit was implemented as part of Framework 20 on May 1, 1997 (1,000 pounds per DAS up to four days, 1,500 pounds per day greater than four days). It was reduced again in Framework 24 to 700 pounds, and then reduced to 400 pounds in an interim action on June 12, 1998. Framework 27 reduced the trip limit to 200 pounds and gave authority to the Regional Administrator of NMFS to again reduce the trip limit to 5-100 pounds when 51 percent of the target TAC was projected to be reached. Less than one month after the start of the 1999 fishing year, the Regional Administrator, based on NMFS' calculations, lowered the Gulf of Maine cod trip limit to just 30 pounds. Large-scale public outcry ensued. Fishermen claimed that they were being forced to throw overboard hundreds, sometimes thousands of pounds of cod. They were disgusted about wasting valuable fisheries resources, and they reported experiencing stress, loss of morale, and loss of job satisfaction as a result of regulatory discarding (see Social Impact Meeting Report in Appendix I). The Council attempted to address this discard situation and eventually increased the trip limit back to 400 pounds in Framework 33.

In addition to increased groundfish restrictions since the reauthorization of the MSFCMA, regulations in other fisheries have increased considerably, thereby reducing opportunities for groundfish vessels to pursue many of the alternative fisheries that were identified in Amendment 7. For example, the federal dogfish fishery has all but disappeared. The annual quota for dogfish is around 4 million pounds, and the trip limits have been reduced to 600 and 300 pounds, eliminating this fishery as a viable alternative to groundfishing and generating a significant amount of regulatory discards. More recently, skate resources have been identified as management concerns, and the Council is currently developing a Fishery Management Plan for the northeast region's skate complex, a resource that was once promoted as an underutilized species. Management of the shrimp, monkfish, squid, scup, and other fisheries has become increasingly restrictive, making it more difficult for groundfish vessels to effectively shift their effort from groundfish to other species.

2002 in particular has been a difficult year full of uncertainty, confusion, and change. The outcome of the recent lawsuit on Framework 33 and the resulting court order implementing additional reductions in the 2002 fishing year and establishing a timeline for Amendment 13 have disrupted fishing activity throughout the region, the social and community impacts of which have not yet been fully realized. Two major adjustments to groundfish measures occurred through the court-ordered NMFS Interim Action (settlement agreement) on May 1, 2002 and August 1, 2002. These actions followed a reversal of a court decision to implement a much more restrictive baseline for allocating DAS for the 2002 fishing year. Changes occurred quickly and numerously in the groundfish fishery during the 2002 fishing year, leaving most affected entities with little opportunity to plan their businesses and/or adapt to the new restrictions. The most significant component of these restrictions included a new baseline for DAS allocations followed by a 20% reduction in allocated DAS. Many vessels remained uncertain about their new DAS allocations right through the beginning of the 2002 fishing year and were disadvantaged in terms of their ability to try to plan their business strategy and maximize what remaining DAS they had. The social impacts of the recent DAS reductions as well as many of the other measures recently implemented in the court order are discussed throughout this assessment.

Another development that is important to consider in the context of this assessment is the recent discovery that an error was made in the measurement of the trawl warps on the NEFSC's Research Vessel Albatross. This error has apparently affected surveys for 2000-2002, which are used in part to assess the status of groundfish stocks. While the impacts of this error are not yet fully understood, the Council is under a court order to move forward with the development of Amendment 13. The trawl survey error has shaken the confidence of fishermen in the scientific and management process and has further compromised the credibility of NMFS and the NEFSC in the eyes of the industry and other sectors of the public. Fishermen feel that scientists must finally acknowledge their longstanding claims that many fishery resources are in better condition than recent scientific information indicates and that major problems exist with the trawl survey. At the time of this writing, scientists remain equivocal about the impacts of the trawl survey error on the current status of the groundfish resources and Amendment 13. Both NEFSC(2002b) and Payne et al. (2003) concluded that the information was suitable for use in making management decisions, but these conclusions did not allay the concerns of fishermen. Resolution of this issue could result in additional social impacts, depending on perceptions about the transparency of the scientific process and the formation of attitudes towards the resolution.

The Council recognizes that a byproduct of continuous incremental plan modifications combined with other factors that have caused disruption and uncertainty in recent time is that cumulative impacts may not be adequately assessed. Even as the individual adjustments themselves are determined to have no significant social impacts beyond those predicted in Amendment 7, they may have generated additive or synergistic effects contributing to a change in the overall magnitude and intensity of social impacts affecting participants in the fishery. Cumulative impact assessment is a process that attempts to provide a broader perspective on these types of changes by characterizing the impacts on a system across time and space occurring in an additive or synergistic manner. To the extent possible, this assessment considers the cumulative impacts of recent fishery management actions as well as the potential impacts of foreseeable future actions not only in the groundfish fishery, but also in other associated fisheries. Many cumulative social impacts since Amendments 5 and 7 are discussed in detail in the Social Impact Informational Meeting Report contained in Appendix I to this amendment.

5.6.1.3 SIA Communities of Interest

The communities that are likely to experience significant impacts from the alternatives under consideration include those with at least one of the following characteristics:

- an active and large multispecies fishing fleet,
- vessels and shoreside facilities that currently depend on groundfish for a substantial portion of their business,
- geographically close to areas proposed for additional seasonal or year-round closure, and
- vessels that hold a substantial amount of latent effort (inactive DAS).

The above criteria qualify almost every one of the 40 primary community and secondary port groups described in the Affected Human Environment, except for the "other" categories and some of the most southern states. Because it is not practical to identify all of these groups as *communities of interest* for this assessment, the following groups have been chosen to represent the diversity, scale, and extent of those involved in the groundfish fishery. Inferences can be drawn about social impacts on other port groups based on the information presented in the Affected Human Environment and the likely distribution of other predicted impacts. All primary community groups have been identified as *communities of interest* for this assessment.

Primary Community Groups

1. Portland, Maine
2. Portsmouth, New Hampshire
3. Gloucester, Massachusetts

4. Boston, Massachusetts
5. Chatham/Harwichport, Massachusetts
6. New Bedford/Fairhaven, Massachusetts
7. Point Judith, Rhode Island
8. Eastern Long Island, New York

Secondary Community Groups

9. Upper Mid-Coast 1, Maine
10. Lower Mid-Coast 1, Maine
11. NH Seacoast
12. South Shore, Massachusetts
13. Provincetown, Massachusetts
14. Eastern Rhode Island
15. Northern Coastal New Jersey

It is important, however, to consider the impacts of the proposed alternatives across all communities. Social impacts can be defined as the changes that a fisheries management action may create in people's way of life (how they live, work, play, and interact), people's cultural traditions (shared beliefs, customs, and values), and people's community (population structure, cohesion, stability, and character). As such, social impacts may result from changes in flexibility, opportunity, stability, certainty, safety, and other factors that are not specific to any community, but oftentimes to any individual or entity experiencing changes resulting from a fishing regulation.

It is possible that the social impacts of some measures under consideration will not be experienced solely by one community group or another; rather, it is likely that some impacts will be experienced across communities, gear sectors, and vessel size classes. An example of this would be a reduction in allocated DAS if it is applied to all multispecies permit holders. Another example would be a mesh restriction for otter trawl vessels. While extra consideration is given to the *communities of interest* for this framework, the potential social impacts of the measures under consideration are discussed generally in this assessment so that their impacts across communities can be understood more clearly.

The following paragraphs summarize recent fishing activity in the *communities of interest*. More information about these and other communities is presented in the Affected Human Environment.

Portland, Maine: In FY99 and FY00, Portland averaged 13,770,600 pounds of groundfish landings and $15,620,900 in groundfish revenues, establishing it as an important port of landing for groundfish vessels and a primary port for the multispecies fishery. The community of Portland is also substantially dependent on groundfish for a significant portion of its total fisheries revenues. In FY99 and FY00, 46 active multispecies vessels homeported in Portland earned more than $10,800,000 in revenues from groundfish. More than 64% of Portland's total fisheries revenues from federally-permitted vessels came from groundfish from FY99 – FY00. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in Portland are even more than 64% dependent on the multispecies fishery. Vessel-level impacts of the Amendment 13 measures, therefore, will vary.

At the social impact informational meeting in Portland, residents of Portland reported having experienced the most significant social impacts from the Amendment 5/7 DAS reductions (Appendix I). Many of Portland's active groundfish vessels possess Individual DAS permits and have experienced a 50% reduction in their Individual DAS. Moreover, most Individual DAS vessels use the majority of their allocated DAS. The measures proposed in Amendment 13 that are likely to impact this community the most are those that modify or further reduce DAS allocations. However, because Portland is such a large and important groundfish port, and because of its location, it is likely that most measures proposed in Amendment 13 will affect this community. The EA for the settlement agreement estimated that 84.9% of groundfish activity in Portland could be affected by the recently-implemented Interim Action.

Portsmouth, New Hampshire: In FY99 and FY00, Portsmouth averaged 2,265,300 pounds of groundfish landings and $2,199,500 in groundfish revenues. The increasing number of multispecies vessels landing in Portsmouth as well as activity at the Portsmouth Co-op indicate that Portsmouth is an important port of landing for groundfish vessels. The community of Portsmouth is also dependent on the groundfish fishery for a significant portion of its total fisheries revenues. In FY99 and FY00, Portsmouth's dependence on groundfish for its total fisheries revenues from federally-permitted vessels averaged about 55%. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in Portsmouth are even more than 55% dependent on the multispecies fishery. Vessel-level impacts of the Amendment 13 measures, therefore, will vary.

At the social impact informational meeting in Portsmouth, residents of Portsmouth and the NH Seacoast reported that they have experienced the most significant social impacts from the Gulf of Maine inshore area closures and the low Gulf of Maine cod trip limits (Appendix I). The measures proposed in Amendment 13 that are likely to impact this community the most, either positively or negatively, are those that modify inshore Gulf of Maine area closures and the Gulf of Maine cod trip limit. However, depending on the alternative selected, other measures have the potential to significantly affect this community (for example, large-scale DAS reductions).

The EA for the settlement agreement estimated that 77.2% of groundfish activity in Portsmouth could be affected by the recently-implemented Interim Action. In addition, business at the Portsmouth Co-op has been affected by the recent reductions. The Co-op even closed temporarily as a result of the measures that were implemented on May 1, 2002.

Gloucester, Massachusetts: In FY99 and FY00, Gloucester averaged 13,670,200 pounds of groundfish landings and $15,553,450 in groundfish revenues. The significant amount of landings and revenues as well as the importance of the Gloucester Seafood Display Auction and other shoreside facilities indicate that Gloucester is an important port of landing for multispecies vessels and a primary port for the multispecies fishery. In FY99 and FY00, an average of 133 vessels homeported in Gloucester generated about $12,207,750 in revenues from groundfish. Since FY94 and probably prior to then, more than 60% of Gloucester's total fisheries revenues from federally-permitted vessels have been generated from groundfish, illustrating Gloucester's substantial dependence on the groundfish fishery. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in Gloucester are even more than 60% dependent on the multispecies fishery. Vessel-level impacts of the Amendment 13 measures, therefore, will vary.

At the social impact informational meeting in Gloucester, residents of Gloucester reported that they have experienced the most significant social impacts from the Gulf of Maine area closures, both year-round and seasonal (Appendix I). Therefore, the measures proposed in Amendment 13 that are likely to impact this community the most, either positively or negatively, are those that modify the Gulf of Maine rolling closures. However, because Gloucester is such an important groundfish port and because of its location, it is likely that most measures in Amendment 13 will impact this community. Large-scale DAS reductions will undoubtedly have significant impacts on this port. The EA for the settlement agreement estimated that 84.5% of groundfish activity in Gloucester could be affected by the recently-implemented Interim Action.

Boston, Massachusetts: In FY99 and FY00, Boston averaged 3,983,150 pounds of groundfish landings and $5,118,750 in groundfish revenues. These landings as well as the historical importance of Boston as a provider of fishing-related support services for smaller communities indicate that Boston is an important primary community. In FY99 and FY00, almost all active vessels homeported in Boston fished for groundfish during some or all of the year. These vessels averaged $4,440,750 in groundfish revenues for Boston. The community of Boston was dependent on the multispecies fishery for almost 56% of its total fisheries revenues from federally-permitted vessels from FY99 – FY00. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in Boston are even more than 56% dependent on the multispecies fishery. Vessel-level impacts of the Amendment 13 measures, therefore, will vary.

At the social impact informational meeting in Boston, participants reported that they have experienced the most significant social impacts from the Amendment 5/7 DAS reductions (Appendix I). Many of Boston's active groundfish vessels possess Individual DAS permits and have experienced a 50% reduction in their Individual DAS. Moreover, most Individual DAS vessels use the majority of their allocated DAS. The measures proposed in Amendment 13 that are likely to impact this community the most are those that modify or reduce DAS allocations and those that change the ways that DAS are counted. The EA for the settlement agreement estimated that 83.2% of groundfish activity in Boston could be affected by the recently-implemented Interim Action.

Chatham/Harwichport, Massachusetts: In FY99 and FY00, Chatham and Harwichport averaged 5,980,850 pounds of groundfish landings and $7,254,100 in groundfish revenues, establishing it as an important port of landing for groundfish vessels and a primary port for the multispecies fishery. Chatham and Harwichport also serve as homeports for a significant number of multispecies vessels. In FY99 and FY00, an average of 95 multispecies vessels homeported in Chatham/Harwichport generated $6,844,500 in revenues from multispecies. Chatham's overall community dependence on multispecies as a percentage of total fisheries revenues from federally-permitted vessels averaged about 71% from FY99 – FY00. It is likely that at least some of the active groundfish vessels in Chatham and Harwichport are even more than 71% dependent on the multispecies fishery.

At the social impact informational meeting in Chatham, a few residents of Chatham and Harwichport submitted comments reporting that they have experienced the most significant social impacts from the May closure on Georges Bank to protect cod (Appendix I). The majority of multispecies vessels from Chatham/Harwichport fish for Georges Bank cod and not Gulf of Maine cod. The measures proposed in Amendment 13 that are likely to impact this community group the most are those that modify or add nearshore area closures on Georges Bank and those that modify the Georges Bank cod trip limit. The EA for the settlement agreement estimated that an average of 46.5% of groundfish activity in Chatham and Harwichport could be affected by the recently-implemented Interim Action.

New Bedford/Fairhaven, Massachusetts: In FY99 and FY00, New Bedford and Fairhaven averaged 26,995,750 pounds of groundfish landings and $30,005,500 in groundfish revenues, establishing it as an important port of landing for groundfish vessels and a primary port for the multispecies fishery. New Bedford/Fairhaven is also an important port of landing for scallop vessels, and its dependence on the scallop fishery for revenues reduces its overall dependence on the multispecies fishery, although many individual vessels may be more dependent on groundfish. In FY99 and FY00, an average of 165 multispecies vessels homeported in New Bedford/Fairhaven generated $24,821,550 in multispecies revenues. Despite these high numbers, New Bedford/Fairhaven's community dependence on groundfish is relatively low compared to other communities of interest, averaging 22% for FY99 and FY00. It is likely, however, that at least some of the active groundfish vessels in New Bedford and Fairhaven are more than 22% dependent on the multispecies fishery. The data suggest that from a community-impact perspective, impacts from the measures in Amendment 13 may be less significant in New Bedford/Fairhaven because the community is less dependent on groundfish for its overall fisheries revenues and because some impacted vessels may have the ability to offset losses in groundfish revenues with revenues from other fisheries. In addition, the multispecies vessels in New Bedford/Fairhaven are significantly larger than multispecies vessels in many other communities, so they may be more suited to adapt to some measures (for example, area closures) by shifting to different fishing areas or changing their fishing practices. However, because they tend to fish offshore on multi-day trips, they could be more impacted by trip limits and DAS reductions. The vessel-level impacts of the Amendment 13 measures will vary.

At the social impact informational meeting in New Bedford, residents of New Bedford and Fairhaven indicated that they have experienced the most significant social impacts from the Amendment 5/7 DAS reductions (Appendix I). Many of New Bedford's active groundfish vessels possess Individual DAS permits and have experienced a 50% reduction in their Individual DAS. Moreover, most Individual DAS vessels use the majority of their allocated DAS. The measures proposed in Amendment 13 that are likely to impact this community the most are those that modify or further reduce DAS allocations and those that change the ways that DAS are counted. The EA for the settlement agreement estimated that 73.3% of groundfish activity in New Bedford could be affected by the recently-implemented Interim Action.

Point Judith, Rhode Island: In FY99 and FY00, Point Judith averaged 2,830,900 pounds of groundfish landings and $2,847,150 in groundfish revenues. Groundfish landings and revenues in this community have increased considerably since the 1994 fishing year, suggesting that Point Judith is becoming a more important port of landing for multispecies vessels. Point Judith's dependence on groundfish for its total fisheries revenues from federally-permitted vessels has also increased significantly in recent years. In FY99 and FY00, an average of 66 multispecies vessels homeported in Point Judith generated $4,868,050 in multispecies revenues for the community. This represented about 18% of Point Judith's total fisheries revenues from federally-permitted vessels (versus 5.5% in FY94). Similar to New Bedford, the data suggest that from a community-impact perspective, the impacts of the measures in Amendment 13 may be less significant in Point Judith because the community is less dependent on groundfish for its overall fisheries revenues and because impacted vessels may have the ability to offset losses in groundfish revenues with revenues from other fisheries. Many of Point Judith's vessels are actively involved in fisheries in the Mid-Atlantic region (squid, fluke, etc.). However, increasing reliance on groundfish in recent years suggests that vessels may have more difficulty shifting effort as restrictions in these other fisheries increase and opportunities decrease. In addition, on an individual-vessel basis, impacts may be more severe. It is likely that at least some of the active groundfish vessels in Point Judith are more than 18% dependent on the multispecies fishery.

At the social impact informational meeting in Point Judith, residents reported that they have experienced the most significant social impacts from gear restrictions and DAS reductions (Appendix I). Gear restrictions were cited compromising the ability to plan a business and ultimately costing everyone affected by the regulation more money. The measures proposed in Amendment 13 that are likely to impact this community the most are gear restrictions and modifications to and/or further reductions in DAS. DAS reductions may affect Point Judith vessels the most by compromising their ability to fish for groundfish as an alternative for other fisheries. The EA for the settlement agreement estimated that 82.7% of groundfish activity in Point Judith could be affected by the recently-implemented Interim Action.

Eastern Long Island, New York: In FY99 and FY00, Eastern Long Island averaged 1,486,600 pounds of groundfish landings and $1,577,500 in groundfish revenues. Groundfish landings and revenues in this community group have increased considerably since the 1994 fishing year, suggesting that Eastern Long Island communities are becoming more important ports of landing for multispecies vessels. Eastern Long Island's dependence on multispecies revenues for its total fisheries revenues from federally-permitted vessels has also increased considerably since the 1994 fishing year. On average, from FY99 to FY00, this community group depended on groundfish for almost 17% of its total fisheries revenues from federally-permitted vessels (versus 2.4% in FY94). It is likely that at least some of the active groundfish vessels in Eastern Long Island are more than 17% dependent on the multispecies fishery. Similar to New Bedford and Point Judith, however, from a community-impact perspective, impacts from the measures in Amendment 13 may be less significant in Eastern Long Island than in other communities because this area is less dependent on groundfish for its total fisheries revenues and because impacted vessels may have the ability to offset losses in groundfish revenues with revenues from other fisheries. Also, most of the multispecies vessels homeported in Eastern Long Island are not using all of their DAS. However, increasing reliance on groundfish in recent years suggests that vessels in Eastern Long Island may have more difficulty shifting effort as restrictions in other fisheries increase and opportunities decrease.

At the social impact informational meeting in Riverhead, residents of Eastern Long Island communities reported that they have experienced the most significant social impacts from increased restrictions in fisheries other than groundfish. DAS were cited as providing flexibility and opportunities for groundfishing when quotas for other fisheries closed or became too restrictive. This is apparent in the increased landings for this community group as well as its increased reliance on groundfish for its total fisheries revenues. Therefore, the measures proposed in Amendment 13 that are likely to impact this community group the most are those that modify or further reduce DAS allocations and those that change the ways that DAS are counted. In addition, the alternatives to address capacity have the potential to significantly impact this community group. The impacts of Amendment 13 will be significant to the extent that DAS changes constrain vessels in Eastern Long Island from shifting effort onto groundfish and increasing their DAS usage in response to regulations in other fisheries. The EA for the settlement agreement estimated that an average of 84.5% of groundfish activity in Eastern Long Island ports could be affected by the recently-implemented Interim Action.

Upper Mid-Coast 1, Maine: This community group includes Rockland, Port Clyde, and surrounding communities. In FY99 and FY00, this group averaged 1,100,250 pounds of groundfish landings and $1,106,300 in groundfish revenues. These values have significantly increased since the 1994 fishing year, suggesting that ports in this community group are becoming more important ports of landing for multispecies vessels. Rockland was historically a very important multispecies port, so increased multispecies activity in this area in recent years may somewhat reflect a return towards historical patterns and/or a re-emergence of groundfish activity lost due to stock declines. In contrast, this community group has become less dependent on multispecies in recent years. The 16 vessels homeported in this area earned an average of $1,192,400 in groundfish revenues from FY99 – FY00. The community group's dependence on groundfish for its total fisheries revenues from federally-permitted vessels averaged 23.1% for this time period (versus 46.1% in FY94). While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in Upper Mid-Coast 1 are more than 23% dependent on the multispecies fishery. Individual vessel impacts, therefore, will vary.

During the social impact informational meetings, some comments were received from Upper Mid-Coast 1 community residents suggesting that DAS reductions since Amendment 5 have had the most significant social impacts on them and their communities (Appendix I). It is difficult to predict which Amendment 13 measures will most significantly impact this community group. Because of its location and multispecies activity, it is likely to experience impacts from most of the Amendment 13 measures that address Gulf of Maine cod, including gear restrictions and modifications to area closures. The alternatives to address capacity are also likely to significantly impact this community group. The EA for the settlement agreement estimated that an average of 86% of groundfish activity in Upper Mid-Coast 1 ports could be affected by the recently-implemented Interim Action.

Lower Mid-Coast 1, Maine: This community group includes Bristol, Boothbay, and surrounding communities. In FY99 and FY00, groundfish landings in Lower Mid-Coast 1 averaged 680,650 pounds and $665,700. These values have significantly declined since the 1994 fishing year, along with landings and revenues from other fisheries, suggesting an overall decline in (federal) fishing activity in the area. Vessels that are homeported in Lower Mid-Coast 1 have become somewhat less dependent on multispecies in recent years. The decline in this community group's dependence on the multispecies fishery is not as significant as the overall decline in fishing activity in this area. The 18 active multispecies vessels homeported in this area earned an average of $1,228,000 in groundfish revenues from FY99 – FY00. This group's dependence on groundfish for its total fisheries revenues from federally-permitted vessels averaged 34% from FY99-00 (versus 46.3% in FY94). While these data reflect the community's declining relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in

Lower Mid-Coast 1 are more than 34% dependent on the multispecies fishery. Individual vessel impacts, therefore, will vary.

It is difficult to predict which Amendment 13 measures will most significantly impact this community group. Because of its location and multispecies activity, it is likely to experience impacts from most of the Amendment 13 measures that address Gulf of Maine cod, including gear restrictions and modifications to area closures. The alternatives to address capacity are also likely to significantly impact this community group. The EA for the settlement agreement estimated that an average of 88% of groundfish activity in Lower Mid-Coast 1 ports could be affected by the recently-implemented Interim Action.

NH Seacoast: This community group includes Hampton, Rye, and Seabrook NH. In FY99 and FY00, the NH Seacoast averaged 970,600 pounds of groundfish landings and $1,066,850 in groundfish revenues. For these two fishing years, an average of 40 multispecies vessels homeported in the NH Seacoast earned $1,542,750 in groundfish revenues for the community group. This community group has become somewhat more dependent on groundfish revenues for its total fisheries revenues from federally-permitted vessels. In FY99 and FY00, community dependence averaged 44%, compared to 37.8% in the 1994 fishing year. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in the NH Seacoast group are more than 44% dependent on the multispecies fishery. Individual vessel impacts of the Amendment 13 measures, therefore, will vary.

At the social impact informational meeting in Portsmouth, residents of Portsmouth and the NH Seacoast reported that they have experienced the most significant social impacts from the Gulf of Maine inshore area closures and the low Gulf of Maine cod trip limits (Appendix I). The measures proposed in Amendment 13 that are likely to impact this community the most, either positively or negatively, are those that modify inshore Gulf of Maine area closures and the Gulf of Maine cod trip limit. However, depending on the alternative selected, other measures will significantly affect this community group (for example, large-scale DAS reductions). The EA for the settlement agreement estimated that an average of 58.7% of groundfish activity in NH Seacoast ports could be affected by the recently-implemented Interim Action.

South Shore, Massachusetts: This community group includes Scituate, Plymouth, and Marshfield, Massachusetts. In FY99 and FY00, the South Shore of Massachusetts averaged 1,499,450 pounds of groundfish landings and $1,619,900 in groundfish revenues. This community group is substantially dependent on groundfish revenues for its total fisheries revenues from federally-permitted vessels. In FY99 and FY00, an average of 50 multispecies vessels homeported in the South Shore group generated $1,582,800 in revenues from multispecies. The South Shore group depended on groundfish for about 48% of its total fisheries revenues in the 1999 and 2000 fishing years, similar to the level of dependence in FY94 (50.2%). Groundfish landings in FY00 were significantly higher than in FY94. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in the South Shore group are more than 48% dependent on the multispecies fishery. Individual vessel impacts of the Amendment 13 measures, therefore, will vary.

At the social impact informational meeting in Scituate, residents of South Shore communities reported that they have experienced the most significant social impacts from the Gulf of Maine inshore rolling closures (Appendix I). Currently, waters adjacent to the South Shore are closed for groundfishing four months of the year, which significantly precludes fishing opportunities and reduces flexibility for the relatively small-sized multispecies vessels in this area. Prior to the Interim Action, these areas were closed for six months. The measures proposed in Amendment 13 that are likely to impact this community group the most, either positively or negatively, are those that modify inshore Gulf of Maine area closures and the Gulf of Maine cod trip limit. However, depending on the alternative selected, other measures will significantly affect this community group (for example, large-scale DAS reductions). The EA for the settlement agreement estimated that an average of 42% of groundfish activity in South Shore ports could be affected by the recently-implemented Interim Action.

Provincetown, Massachusetts: In FY99 and FY00, Provincetown averaged 988,000 pounds of groundfish landings and $989,250 in groundfish revenues. Groundfish activity in Provincetown increased significantly in FY00 and was higher in FY00 than when Amendment 5 was implemented in the 1994 fishing year. In FY99 and FY00, 22 multispecies vessels homeported in Provincetown earned an average of $1,169,700 in multispecies revenues for the community. For these two fishing years, Provincetown's dependence on multispecies for its total fisheries revenues from federally-permitted vessels averaged 45.4% (versus 52.7% in FY94). Provincetown's activity in the whiting fishery has increased since FY94, contributing in part to decreased dependence on large-mesh groundfish. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in Provincetown are more than 45% dependent on the multispecies fishery. Individual vessel impacts of the Amendment 13 measures, therefore, will vary.

Although no social impact informational meeting was held in Provincetown, it can be assumed that impacts in P-town have been somewhat similar to those experienced by residents of South Shore communities. The measures proposed in Amendment 13 that are likely to impact this community the most, either positively or negatively, are those that modify inshore Gulf of Maine area closures and the Gulf of Maine cod trip limit. However, depending on the alternative selected, other measures will significantly affect this community (for example, large-scale DAS reductions). The EA for the settlement agreement estimated that 77% of groundfish activity in Provincetown could be affected by the recently-implemented Interim Action.

Eastern Rhode Island: This community group includes Newport, Tiverton, Portsmouth, and surrounding communities. In FY99 and FY00, Eastern RI averaged 1,320,750 pounds of groundfish landings and $1,321,000 in groundfish revenues. Relative to other communities of interest, this community group is not as dependent on the groundfish fishery. In FY99 and FY00, an average of 25 multispecies vessels homeported in Eastern RI communities generated $1,049,300 in revenues from multispecies. The Eastern RI group depended on groundfish for about 11.5% of its total fisheries revenues in the 1999 and 2000 fishing years, similar to the level of dependence in FY94 (10.5%). While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in the Eastern RI group are more than 11% dependent on the multispecies fishery. Individual vessel impacts of the Amendment 13 measures, therefore, will vary.

It is difficult to predict which Amendment 13 measures will most significantly impact this community group. Because of its location and multispecies activity, it is likely to experience impacts from most of the Amendment 13 measures that address Southern New England stocks, including gear restrictions, trip limits, and further DAS reductions. The alternatives to address capacity are also likely to significantly impact this community group. The EA for the settlement agreement estimated that an average of 52% of groundfish activity in Eastern RI ports could be affected by the recently-implemented Interim Action.

Northern Coastal New Jersey: This community group includes Point Pleasant, Belford, Barnegat Light, and surrounding communities. In FY99 and FY00, Northern Coastal NJ averaged 783,750 pounds of groundfish landings and $735,150 in groundfish revenues. Relative to other communities of interest, this community group is not dependent on the groundfish fishery despite the large number of active multispecies vessels in the area. In FY99 and FY00, an average of 62 multispecies vessels homeported in Northern Coastal NJ communities generated $766,700 in revenues from multispecies. Yet the Northern Coastal NJ group depended on groundfish for only 3% of its total fisheries revenues in the 1999 and 2000 fishing years, similar to the level of dependence in FY94 (3.1%). These vessels are generating much higher revenues from other fisheries. While these data reflect the community's relative dependence on the groundfish fishery, it is important to remember that at least some of the individual groundfish vessels in the Northern Coastal New Jersey group are more than 3% dependent on the multispecies fishery. Individual vessel impacts of the Amendment 13 measures, therefore, will vary.

It is difficult to predict which Amendment 13 measures will most significantly impact this community group. Because of its location and multispecies activity, it is likely to experience impacts from most of the Amendment 13 measures that address Southern New England stocks, including gear restrictions, trip limits, and further DAS reductions. Its low dependence on groundfish suggests that there is a substantial amount of latent effort in the area, so the alternatives to address capacity are likely to significantly impact this community group. The EA for the settlement agreement estimated that an average of 81% of groundfish activity in Northern Coastal NJ ports could be affected by the recently-implemented Interim Action.

5.6.2 Dependence Rankings for Communities of Interest

Both dependence on fisheries in general and dependence on the multispecies fishery are important to consider for the communities that are involved in groundfish harvesting that are most likely to be impacted by the proposed management measures. The MARFIN Report focuses on overall community dependence on fisheries; the additional information presented in this amendment focuses on dependence on the multispecies fishery in particular. Both measures of dependence are summarized below.

In the MARFIN Report, *fishing dependence* was assessed based on three indices: 1) the percentage of labor force involved in fishing, 2) the percentage of related occupations within the Bureau of Labor Statistics category of fisheries/forestry/farming, and 3) a summary measure of a series of dependence ratios that compare the number of fishermen per hundred community residents to various alternative occupational roles that fishermen could enter with their particular skill profiles. The last of the indices described above, the occupational alternative index, is the most useful tool for comparison across different communities in the region (MARFIN 2001).

The MARFIN Report divides the New England region into eleven sub-regions, which are also consistent with the sub-regions analyzed for this amendment using the IMPLAN model, and then ranks these sub-regions from highest to lowest, based on fishing dependence. Table 333 below is from the MARFIN report and provides the fishing dependence indices for each sub-region. The MARFIN report explains that the three sub-regions with the highest dependence (Downeast Maine, Upper Midcoast Maine, Cape and Islands) share some characteristics that make these communities significantly more dependent on fishing resources than other regions of New England. These three regions are all relatively isolated from other parts of New England and have small islands and harbors, which give fishermen easy access to nearby fish and shellfish grounds. MARFIN suggests that the occupational alternative index is significantly lower for the Cape and Islands as compared to the two sub-regions in Maine because the Cape has experienced intense pressures from tourism and gentrification. However, there is variation among ports within these sub-regions. For example, Chatham is one town on Cape Cod that has remained an active fishing port over the years and has supported a successful fishing industry despite low biomass levels, increased regulations, and pressures from the recreational fishing and tourism industries.

MARFIN SUB-REGION	% Related Occupations	% of Total Employed	Alternative Occupation Ratio Summary
Downeast Maine	45	3.6	255.54
Upper Midcoast Maine	36	2.0	171.05
Cape and Islands	27	0.79	104.43
Lower Midcoast Maine	23	0.46	51.32
New Bedford/South Shore	27	0.40	38.95
Southern Maine	23	0.39	36.94
Rhode Island	24	0.31	30.86
Gloucester/North Shore	20	0.21	24.91
New Hampshire Coast	8	0.09	9.46
Boston Area	7	0.05	6.39
Connecticut Coast	2	0.01	2.61

Table 333 Comparative Fishing Dependence Indices for the Eleven Sub-regions of New England (MARFIN 2001)

**The MARFIN Report did not examine communities south of Connecticut.*

For the purposes of this assessment, groundfish revenues expressed as the percentage of total fisheries revenues from federally-permitted vessels homeported in a particular community group represents the community group's current dependence on the groundfish fishery. Information about dependence for all community groups can be found in the Affected Human Environment. Table 334 ranks average dependence on multispecies from FY99 and FY00 for the *communities of interest*. (Note that there may be other community groups that rank higher than some of the following groups. See the Affected Human Environment for more information.)

RANK	COMMUNITY GROUP	AVERAGE GROUNDFISH DEPENDENCE FY99-FY00
1	**Chatham/Harwichport, MA**	71.1%
2	**Portland, ME**	64.3%
3	**Gloucester, MA**	61.7%
4	**Boston, MA**	55.7%
5	**Portsmouth, NH**	54.7%
6	**South Shore, MA**	47.7%
7	**Provincetown, MA**	45.4%
8	**NH Seacoast**	44%
9	**Lower Mid-Coast 1, ME**	34%
10	**Upper Mid-Coast 1, ME**	23.1%
11	**New Bedford/Fairhaven, MA**	22.3%
12	**Point Judith, RI**	18.3%
13	**Eastern Long Island, NY**	16.9%
14	**Eastern RI**	11.5%
15	**Northern Coastal NJ**	3%

Table 334 – Ranking of Dependence on Groundfish for Communities of Interest

5.6.2.1 SIA Factors

To the extent possible, the social impact factors described in the following subsections will be considered relative to the management alternatives under consideration and will be used as a basis for comparison between alternatives. Use of these kinds of factors in social impact assessment is discussed in Burdge's *Conceptual Approach to Social Impact Assessment* (Burdge 1998).

A significant amount of information relating to the factors described below was collected during the Council's Social Impact Informational Meetings and can be found in the Report from those meetings (Appendix I). The information collected at these meetings formed the basis for selecting the following SIA factors. While this assessment does not quantify the impacts of the management measures relative to the individual factors, qualitative discussion of the potential changes to the factors characterizes the likely direction and magnitude of the impacts. Assessment of the potential changes to the social impact assessment factors also should be considered in the following context:

1. *Size and demographic characteristics of the fishery workforce in the community* –changes in these factors reflect demographic, income, and employment impacts in relation to the community's available fishery workforce
2. *Cultural issues* – attitudes, beliefs, values of fishermen, their families, and their communities
3. *Social structure and organization* – the ability of communities to provide necessary social support and services to families
4. *Non-economic social aspects* – lifestyle, health, and safety issues
5. *Historical dependence on fishery* – reflected in the structure of fishing practices and income distribution

The following five social impact factors are described below: regulatory discarding; safety; disruption in daily living; changes in occupational opportunities and community infrastructure; and formation of attitudes. Discussion of these factors below also includes important information related to cumulative impacts and the social impacts of the alternatives under consideration in this amendment.

5.6.2.1.1 Regulatory Discarding

Description: forced discarding of marketable and oftentimes dead fish as a direct result of management measures; usually a byproduct of trip limits, quotas, and minimum fish sizes

Regulatory discarding is an important social problem, just as it is an ecological problem. Low trip limits resulting in excessive discarding leave fishermen feeling demoralized and disgusted with fishing, which is more than just a job to most fishermen. Fishermen recognize that discarding marketable and oftentimes dead fish does nothing to benefit them or their families, the health of the resource, their disappearing hold on local fresh fish markets, or seafood consumers. Fishing is a family business, so the impacts of this are felt throughout the entire family and the entire community involved in groundfish harvesting.

Discussion: Although regulatory discarding has been identified as a social problem in most communities involved in groundfishing throughout the region, the inshore Gulf of Maine groundfish fleet in particular has struggled with the low Gulf of Maine cod daily trip limit and the negative social impacts of regulatory discarding since the 1999 fishing year. At the groundfish Social Impact Informational Meetings, many residents of Portsmouth NH, the NH Seacoast, Gloucester, and South Shore MA communities cited low Gulf of Maine cod trip limits as having resulted in the most significant social impacts for their respective communities since the implementation of Amendment 5. Fishing fleets in these communities consist primarily of smaller and mid-size vessels that fish short trips (<2 days) in inshore areas. Many of these vessels do not have the capability to travel safely to other areas to fish. They are therefore limited to areas that unfortunately contain concentrations of codfish, so they sometimes encounter significant amounts of cod even when fishing for other species.

The multispecies nature of the groundfish fishery and the physical limitations of the inshore fleet have exacerbated the problems associated with regulatory discarding in these areas. Some of the affected boats have reported that this problem is further worsened by the timing of the inshore rolling closures and the pulses of concentrated effort in the inshore areas during the limited opportunities in the spring and early summer for smaller vessels to fish. In addition, the cumulative effect of regulatory discarding resulting from management measures in other fisheries has increased related social impacts. For years, both commercial and recreational fishermen have testified that they are being forced to throw overboard thousands of pounds of spiny dogfish due to the very low trip limits and annual quota.

Alternatives that propose to increase the Gulf of Maine cod trip limit may reduce regulatory discarding and consequently, the negative social impacts resulting from regulatory discarding in the most affected Gulf of Maine communities involved in groundfish harvesting. Industry testimony from the inshore Gulf of Maine fleet suggests that a higher trip limit could convert at least some discards to landings and may result in even more positive impacts than can be predicted. By increasing the trip limit to a level that allows inshore boats to "make a day's pay," the industry maintains that the Council could indirectly encourage some vessels to end their trips without fishing through cod (and continuing to discard it) for other species. This could reduce regulatory discarding not only on Gulf of Maine cod, but also on other species that may be caught while fishing on a multispecies trip. While these impacts are difficult to predict, it is without question that the social impacts of an increased Gulf of Maine cod trip limit would be positive for the inshore groundfish fleet and their respective communities.

One caveat is that while short-term negative impacts may be reduced and short-term positive impacts may result from an increase in the Gulf of Maine cod trip limit, long-term negative impacts could be more severe if a higher trip limit increases fishing mortality on Gulf of Maine cod and consequently compromises the objectives of this amendment. Fishermen's behavior cannot be predicted definitively, and there is some concern that increasing the trip limit could increase directed fishing on Gulf of Maine cod. There is a fine line that cannot be identified between allowing vessels to make a day's pay and encouraging them to increase their directed trips on Gulf of Maine cod, especially in the inshore areas where the resource may be more easily accessible for short, directed trips. It must be acknowledged and understood that if an increased trip limit results in increased fishing mortality on Gulf of Maine cod, additional and perhaps more severe restrictions may be required in the future. Some sectors of the fleet that claim that they are not experiencing problems with regulatory discarding at this time are particularly concerned about this potential outcome. Most alternatives under consideration in this amendment address these concerns by proposing very modest increases in the trip limit, only seasonal increases in the trip limit, and/or additional measures to reduce Gulf of Maine cod fishing mortality.

Alternatives that propose new trip limits on species like Southern New England yellowtail flounder, Cape Cod yellowtail flounder, and Georges Bank cod affect regulatory discarding negatively for other communities south of the Gulf of Maine. To minimize this, trip limits should be set at the most reasonable level to affect behavior on the target stock without compromising the intent by simply converting landings to discards. The Council should consider past history with Gulf of Maine cod when selecting new trip limits for other groundfish species.

Hard TACs may also affect regulatory discarding if they are so low that discarding results in non-directed fisheries once the TAC is reached and the directed fishery is closed. This is very likely in the groundfish fishery, which is multispecies in nature. Most vessels catch 3-4 species of groundfish on any given trip, so they may continue to fish for some groundfish despite the TACs being reached for other species that they catch. This is even more likely if DAS are reduced to the point that vessels must maximize their remaining days in order to maintain their viability.

Measurement: The best tools for measuring this factor include surveys, focus groups, and key informant interviews to gain more perspective on individual perceptions about regulatory discarding and its effects on stress, morale, job satisfaction, and quality of life. For this assessment, information about this factor was obtained primarily from the Social Impact Informational Meeting Report, summarizing a series of ten focus group meetings throughout the region. Additional information relative to this factor was gained from the Council's Advisory Panels, scoping meetings, public hearings, and discussions with other community groups and panels.

Assessment of this factor should address the following questions:

- Is the proposed action likely to force fishermen to throw marketable fish overboard?
- Is the level of regulatory discarding under the proposed action likely to be higher than that under the no action alternative?
- Is the difference between regulatory discarding under the proposed action and the no action alternative likely to be high enough to generate significant negative social impacts?

5.6.2.1.2 Safety

Description: the ability of fishermen to maintain safe operations at sea; this factor can be compromised by various adaptations to additional regulations and decreased fishing opportunities; usually a result of closed areas and DAS modifications

The safety of fishermen and fishing operations at sea is an extremely important social impact factor, as decreased safety often increases stress at the individual and family level, which can exacerbate many other family and societal problems. In addition, the impacts of fishing-related casualties can be felt throughout communities involved in fishing, many of which are close-knit groups with longstanding family and social networks.

Discussion: Updated safety information for the multispecies fishery is presented in the Affected Human Environment. In addition, safety was an important social issue discussed during the groundfish Social Impact Informational Meetings in many contexts:

- Many vessels are carrying reduced numbers of crew in order to adapt to decreased income from fishing. In Gloucester, meeting participants reported that larger vessels used to fish with numerous crew members; now, in order to offer their crew members an adequate share, these boats are fishing with far fewer crew. Many owner-operators on smaller vessels fish alone for some or all of the year. This problem is coupled with the fact that the regulations have made it difficult to offer crew members a reliable/consistent source of income from fishing, so even when carrying reduced numbers of crew, vessels are having trouble finding crew members at all.
- Vessels are traveling much farther from shore to fish for groundfish. This shift has resulted primarily from the Gulf of Maine area closures. There are many boats in the Gulf of Maine less than 50 feet in length that were not designed to fish far offshore, especially in adverse weather conditions.
- For boats that are traveling farther from shore to fish, the length of the workday has increased considerably. Today, it is common to see day trips lasting 18-24 hours, primarily because of added steam time to reach open fishing grounds. These fishermen are probably more exhausted than ever, and this can lead to more injuries and accidents, especially since many of these fishermen are now working alone.
- Overall, fishermen feel as though they must take more risks to fish when they have the opportunity to do so. Instead of staying home when the weather is bad, some fishermen are choosing to fish through the bad weather because of an impending area closure and/or because they fear that they may not be able to fish for some period of time in the future.

Measures implemented in this amendment may affect the safety of fishermen and fishing operations, and to the extent possible, the Council should strive to implement measures that maximize the safety of human life at sea. To the extent that the Council can maximize safety at sea, negative social impacts resulting from the Amendment 13 management measures and related to concerns about safety can be minimized. For Amendment 13, changes to area closures have the potential to affect safety at sea to the extent that they force, directly or indirectly, small vessels to fish farther from shore.

Proposed DAS modifications also could affect safety. For example, counting DAS at a 2:1 rate during some portion of the year may indirectly encourage vessels to fish during the other times when their DAS are not counted at a higher rate. If these other times are during the winter, fishing effort could increase when weather is more extreme and less predictable, possibly reducing the ability of some vessels to remain safe at sea. In addition, since fishing for groundfish is currently quite limited for the dependent vessels (those that use most or all of their DAS), further reducing DAS could compromise safety if fishermen take more risks to maximize their diminishing opportunities. During the Social Impact Informational Meetings, these kinds of adaptations to DAS reductions were noted to have occurred throughout the region after Amendments 5 and 7. It is therefore likely that additional negative social impacts related to safety occurred as a result of the Interim Action and will occur in Amendment 13 if DAS are further reduced.

Hard TACs are also likely to negatively affect the safety of fishing operations at sea to the extent that they force a derby fishery or a race to fish. Sometimes, low quotas can encourage pulses of fishing effort, especially if the species is commercially valuable. This can be exacerbated by DAS reductions that create a need to maximize profits on remaining DAS. If the quota creates a derby during the winter, it could compromise safety at sea.

Measurement: The best tools for measuring this factor include surveys, focus groups, and key informant interviews to gain more perspective on individual perceptions about safety and its effects on stress, families, and overall quality of life. For measurement in this assessment, information was obtained primarily from the Social Impact Informational Meeting Report, the MARFIN Report, and McCay and Cieri 2000. Additional information relative to this factor was gained from the Council's Advisory Panels, scoping meetings, public hearings, and discussions with other community groups and panels. GIS-based technologies are also useful to assess the potential impacts on this factor by examining the for vessels to fish farther from shore as a result of the proposed management measures.

Assessment of this factor should address the following questions:

- Is the proposed action likely to compromise the safety of fishermen and/or fishing operations more than the no action alternative?
- Will fishermen need to travel to new fishing grounds or fishing grounds further away from their homes as a result of the proposed action?
- Is it likely that fishermen will make adaptations to the proposed management action that could compromise their safety (taking less crew, fishing in bad weather)?

5.6.2.1.3 Disruption in Daily Living

Description: changes in the routine living and work activities of affected fishery participants, including the potential for alteration in their regular social and work patterns to adapt to new management measures

Consideration of this factor includes vessel flexibility and the ability of fishermen to switch between fisheries, areas, and gears seasonally and/or in response to market conditions. Year-round and seasonal fishing opportunities are important to consider. These opportunities also relate to fishermen's chances to successfully adapt to new regulations. Impacts on this factor are associated with the ability of affected industry members to develop both short-term and long-term business plans. Another related impact can be experienced through the loss of crew and/or the inability to retain reliable crew members on a year-round basis.

Discussion: Changes in established daily patterns – patterns that, in the case of communities involved in fishing, are often internally-generated and regulated and highly-regimented – can provide a key component to social impact assessment. Although the existence, nature, and evolution of these patterns in communities involved in fishing is well-documented by marine anthropologists, the effects of changes to them have often been overlooked in conducting social impact assessments for fisheries management. Ideally, measurement of disruption in daily living should include an assessment of the outcomes of any periods of inactivity, including changes in social stress and stress-related health problems, job satisfaction, crime rates, and family cohesion.

The most obvious impacts related to this factor occur when fishermen lose the ability to fish for some period of time; negative impacts increase as the time during which the fishermen cannot fish increases. Periods of inactivity disrupt daily living patterns and increase stress that can affect the entire family. In addition, if these periods of inactivity are experienced by many residents within a community, negative social impacts can be experienced throughout the community. Shoreside businesses may find it difficult to maintain year-round income without a functional local fleet, so over the long-term, significant impacts can result from disruptions in daily living that ultimately change occupational opportunities and community infrastructure. Impacts related to these factors are discussed in more detail in following sections of this assessment.

The following summarizes some of the discussion relative to disruption in daily living patterns from the groundfish Social Impact Informational Meetings:

- Because of increased regulations in many fisheries, small vessels have lost much of their flexibility to move from one fishery to another. In Chatham, meeting participants felt that regulations have "boxed them in" to particular fisheries, making it difficult or impossible for them to maximize their opportunities and/or adjust to changing conditions. When combined with the inherent limitations of small vessels, the regulations have reduced fishing opportunities to the point that many fishermen cannot guarantee a year-round income from fishing for themselves or for their crew.
- Uncertainty about the regulations and the future of the groundfish fishery in New Bedford has made both business and family planning difficult, if not impossible. Uncertainty has contributed to the lack of new entrants in the fishery as well as family stresses associated with long-term finances and planning for the future.
- Some meeting participants in Portland discussed the loss of flexibility resulting from the groundfish regulations. They reported that historically, groundfishing used to be a fishery that the Portland fleet would use to "fill in" seasonally and/or with fluctuations in other fisheries. Ironically, groundfish regulations have limited some of these other fishing opportunities and made much of the fleet almost entirely dependent on groundfish.
- Increased regulations in many fisheries have limited the flexibility of the Long Island fishing fleet and made it more difficult to make a year-round income from fishing. Long Island vessels have depended on the diversity and flexibility of switching target species (squid, whiting, scup, and others including groundfish) as stocks fluctuate, the mix of species in an area changes, and/or market conditions change. Seasonal quotas and other management measures have decreased fishing opportunities and limited the flexibility of this fleet, particularly smaller vessels.
- The core of Boston's fishing fleet has diminished significantly; in addition, fewer transient vessels are landing in Boston and taking advantage of the convenient services the pier has to offer (proximity to transportation, processing facilities, ice, etc.). Landings are down, and overall activity in the port has decreased. Meeting participants estimated that the number of vessels landing at the Boston Fish Pier fell from more than 30 in 1995 to less than 12 in the past year. Most of the remaining vessels maximize their DAS usage in the winter to capitalize on better prices and then tie-up for several months at a time. This adaptation has exacerbated financial and employment problems for shoreside support services.

The implementation of new or additional seasonal and year-round closed areas is likely to negatively affect this factor. Nearshore closed areas can induce significant periods of inactivity, especially for small vessels that cannot travel to other areas to fish. In the more extreme cases (closures for six months or more, for example), some fishermen may be forced to seek alternative employment opportunities to support their families. These fishermen often lose their crew members and face additional problems during the time when they can fish. They also encounter more difficulty maintaining their fishing operations due to the loss of a reliable income. For vessels that can travel to other areas to fish, the closed areas still result in disruption in daily living patterns and negative social impacts, as most of these vessels end up traveling farther from shore to fish, potentially compromising their safety and increasing stress at the family level because fishermen are forced to spend more time away from home and fish longer days.

DAS modifications, particularly reductions, and Hard TACs can also cause significant disruption in daily living and fishing patterns. In communities with vessels that rely on the groundfish fishery and use the majority of their DAS, additional DAS reductions can cause major alterations in fishing practices. Some larger boats will be forced to maximize their remaining groundfish opportunities by fishing only during times when market conditions are best, which can be during winter when weather is less predictable and more extreme. In order to reduce their fishing-related expenses, some vessels may fish their remaining DAS during one time of the year and tie up their vessels during another time. This causes disruptions for related shoreside businesses and can ultimately result in further social and economic dislocation. Hard TACs can produce similar impacts related to disruptions in daily living to the extent that they create a derby or a race to fish.

Measurement: The best tools for measuring this factor include surveys, focus groups, and key informant interviews to gain more information about daily living patterns and the impacts of changes to these patterns on stress, families, and overall quality of life. For measurement in this assessment, information was obtained primarily from the Social Impact Informational Meeting Report, the MARFIN Report, McCay and Cieri 2000, and the ME DMR Groundfish Regulation Impact Survey in 2002. Additional information relative to this factor was gained from the Council's Advisory Panels, scoping meetings, public hearings, and discussions with other community groups and panels.

Assessment of this factor should address the following questions:

- How could the proposed action alter the daily living and work patterns of fishing families in the affected communities?
- Will fishermen need to travel to new fishing grounds or fishing grounds farther away from their homes as a result of the proposed action? Will fishermen be spending more time away from home as a result of the proposed action?
- Will fishermen experience longer periods of inactivity as a result of the proposed action?
- Compared to the no action alternative, could the proposed action increase stress at the family level as a result of disruptions in daily living patterns?

5.6.2.1.4 Changes in Occupational Opportunities and Community Infrastructure

Description

Changes in Occupational Opportunities: the degree to which the implementation of the management measures in this amendment could alter the occupational profile of the affected communities.

Changes in occupational opportunities can lead to changes in household/family income, classes, and lifestyles. In assessing this variable, both the short-and long-term shifts in job opportunities should be considered. This includes changes to year-round and seasonal fishing opportunities, short-term and long-term dislocation from the fishery, employment opportunities, and the ability to find and keep crew.

Flexibility for the fishing fleet and the ability to plan business ventures over the short-term and long-term also are related factors. Changes in occupational opportunities are not only important to consider for the commercial fishing fleet, but also the recreational and party/charter fleet.

External forces (status of economy, community shifts away from fishing and towards tourism, etc.) can influence the magnitude and direction of changes in occupational opportunities. Emphasis should be placed on identifying potential changes in the unique social and family arrangements that characterize the communities under consideration, particularly on changes in household employment patterns, trends in family-run fishing businesses, and participation in job retraining programs. Special consideration should also be given to social and cultural values and norms that may be affected by changes in opportunity, such as long-term family involvement in the fishery, job satisfaction, and respect for fishing as an occupation and a way of life.

Changes in Community Infrastructure – the increase or decrease in the demand and supply of basic infrastructure services and facilities essential to fishing in the affected communities, including processors, seafood markets, boat and equipment repair shops, bait and ice providers, display auctions, cooperatives, creditors, legal services, etc.

The cost, quality, availability, and location of fishing-related services can affect community members' business practices, satisfaction with their community, and overall well-being. Additionally, these service industries provide alternative fishing-related employment opportunities in communities and can contribute significant revenues to the city and county in which the community involved in fishing is located. Impacts on this social impact factor are directly connected to disruptions in daily living patterns and other factors. They are also more long-term in nature.

Discussion

Changes in Occupational Opportunities: Over time, many groundfish regulations have affected occupational opportunities for communities involved in fishing throughout the region. The following summarizes some of the discussion relative to changes in occupational opportunities from the groundfish Social Impact Informational Meetings:

- In Gloucester, community residents feel that the rolling closures have severely reduced the flexibility of the fleet and have precluded fishermen from making a year-round income from fishing. Fishermen have difficulty taking advantage of seasonal fluctuations in stocks, markets, and/or fisheries and fishing accordingly. In addition, they report that the western Gulf of Maine closure has precluded many vessels from seeking viable alternative fisheries (pollock, some flatfish) and thus further limits their flexibility and ability to adapt to regulations.
- In Portsmouth, some people reported that they have had a very difficult time keeping up with the changing regulations, and it has become impossible to plan ahead and develop financial and other mechanisms to adapt to new or different regulations. In addition, meeting participants cited problems keeping year-round crew, loss of employment stability, and resultant increased stress at the individual and family level as direct consequences of the inshore Gulf of Maine rolling closures.
- In Portland, residents reported that with increasing regulations and uncertainty about the future, fishermen are more reluctant to invest in alternative fisheries. As a result, the fleet has adapted by relying less on the flexibility to switch between fisheries as they did historically, and more on maximizing their limited opportunities in the groundfish fishery. Vessel owners also are finding it increasingly difficult to employ reliable and experienced crew members on a year-round basis. Eighty eight groundfish days-at-sea alone does not offer enough opportunity to maintain an adequate crew on a large dragger, and some of these boats have few alternatives (some fish for shrimp and/or herring seasonally).

- DAS reductions were cited as having precluded year-round fishing opportunities in Boston; now, most vessels from Boston fish most or all of their DAS during the winter and tie-up their vessels for 3-5 months.
- Several meeting participants from the South Shore agreed that the six-month rolling closures (Blocks 124 and 125 in particular) represent a 100% groundfish closure for them. Currently, October, November, and January – April are closed to gear capable of catching multispecies; in December, 400 pounds of cod cannot cover trip expenses. The other five months (May – September) are historically when most of the South Shore fleet would shift their effort from groundfish to dogfish. Dogfish is no longer a viable fishery for federal permit holders, so many of these vessels are experiencing great difficulty maintaining occupational opportunities on a year-round basis.

Some measures under consideration may reduce opportunities for recreational and party/charter vessels that currently may be able to access offshore areas. Long-term occupational opportunities in some communities could be impacted by this action to the extent that these measures would reduce employment in the recreational sector and overall community revenues generated from recreational fishing.

Some measures implemented in this amendment could intensify negative social problems associated with changes in occupational opportunities over the long-term. Examples include changes to the inshore area closures that reduce flexibility and opportunities and modifications that reduce DAS and/or make DAS less efficient or productive. Depending on the economic costs, gear restrictions and new mesh regulations could also contribute to reductions in occupational opportunities to the extent that marginal vessels are not able to absorb the costs of the new gear. DAS reductions, however, are likely to be most responsible for the changes in occupational opportunities that may occur in communities involved in fishing over time as a direct result of fisheries management actions. Changes in occupational opportunities are important to consider in relation to the alternatives under consideration to address capacity.

Changes in Community Infrastructure: Increasing restrictions in groundfish and almost all fisheries are reducing opportunities throughout the industry and resulting in a significant downsizing of commercial fleets in most communities. For example, industry members in Boston estimated that the number of vessels landing at the Boston Fish Pier fell from more than 30 in 1995 to less than 12 in the past year. Some of these vessels relocated to other ports because of the regulations, while some exited the fishery altogether. Downeast Maine and other community groups in Maine also have experienced significant fleet downsizing as Maine's groundfish fleet has concentrated around Portland. A resident of Bar Harbor recalled that there were 20 groundfish vessels in his community during the 1980s. There were also groundfish fleets in Southwest Harbor and Stonington. This year (2000), three vessels in these communities landed fresh fish.

While groundfish regulations have contributed to difficulty finding and keeping experienced crew, the industry reports that it also is quickly losing its shoreside labor pool due to more attractive alternative employment opportunities. The fleet and industry have downsized, and so have remaining shoreside support services. The industry reported the loss of cutting houses, processing plants, and ice houses throughout coastal communities. This has eliminated job opportunities and caused qualified laborers who rely on year-round employment to seek jobs elsewhere. Many people worry that this trend is irreversible given uncertainty in the fishing industry and the benefits and stability that many other shoreside labor industries are able to offer their employees.

Competition for commercial and residential waterfront property has increased and resulted in higher real estate prices and taxes, as residents of most communities involved in fishing are witnessing a long-term shift towards recreational and tourist-oriented uses of the waterfront. Downeast Maine residents described transitions in their own communities, still very dependent on fisheries, as local tackle and supply businesses are replaced with art galleries and bookstores. The industry is finding it more difficult to afford to live in their communities and maintain the shoreside infrastructure necessary to support their fisheries. Many people worry about whether their community will be able to support increased activity as stocks continue to recover and yields continue to increase.

Related to these problems is the loss of new and young entrants to the fishery. Uncertainty, instability, and loss of opportunity are discouraging the younger generation from pursuing fishing as a way of life. According to meeting participants, parents are no longer encouraging their children to carry on the family tradition of fishing; instead, they are encouraging them to seek higher education and enter a more promising and stable career. Unfortunately, this sometimes requires the children to leave the community because employment opportunities outside of fishing and similar industries are scarce.

The groundfish measures most likely to impact this factor over the long-term may be those that generate the most significant economic impacts, as economic impacts can affect business opportunities and the ability for the industry to diversify over the short-term. Some examples of the measures to consider in this framework adjustment include DAS reductions, mesh changes (if they are costly and affect a large number of groundfish-dependent vessels), and area closures.

Measurement

Measurement of this factor is the most complex and involves many sources of information. This factor relates most directly to economic aspects of the fishery; therefore, the analysis of economic impacts provided in this amendment helps most to predict changes to occupational opportunities and community infrastructure as well as resulting social impacts. Predictions about the impacts of the alternatives on gross revenues (section 5.4.4) and the results of the IMPLAN I-O model (section 5.4.8.3) are primary sources of information to measure this factor and provide a basis to quantify the social impacts related to this factor.

Social and demographic data including Census data and information from regional retraining centers is helpful to assess this factor. In addition, measurement tools like surveys, focus groups, and key informant interviews often provide information related to occupational opportunities for the fishing industry and specific aspects of community infrastructure. For this information, the Social Impact Informational Meeting Report, MARFIN Report, McCay and Cieri 2000, and the ME DMR Groundfish Regulation Impact Survey were referenced. Additional information relative to this factor was gained from the Council's Advisory Panels, scoping meetings, public hearings, and discussions with other community groups and panels.

Assessment of this factor should address the following questions:

- Could the proposed action change the structure and/or composition of New England's fishing fleets?
- Is the proposed action likely to result in a significant loss of employment opportunities within the affected communities?
- Will affected fishermen have alternative fishing opportunities under the proposed action?
- Compared to the no action alternative, will the proposed action significantly affect the ability of shoreside infrastructure to maintain year-round business opportunities?

5.6.2.1.5 Formation of Attitudes

Description: positive or negative feelings, beliefs, or positions expressed by impacted members of communities involved in fishing regarding the proposed action

This factor provides information about the community climate that prevails and can help to assess the potential for success with Amendment 13 and the need for mitigation in some circumstances. Consideration of this factor can provide for a better understanding of how changes induced by the proposed action could influence the affected communities. In addition, management measures that are more preferred or supported by the fishing industry generally encounter more success over the long-term than measures that are opposed or that the industry feels are forced upon them. Some support the notion that compliance with regulations is directly related to the degree of support for the regulations or faith that they will be effective in achieving their objectives.

Discussion: It is difficult to predict which measures in Amendment 13 will affect this variable the most. On one hand, the formation of attitudes towards regulatory discarding in the recent past has been so negative that any measure reducing regulatory discarding should generate positive impacts. On the other hand, proposals to further reduce DAS or change the way that DAS are counted have already been met with strong opposition by fishermen throughout the region. While some measures may improve attitudes towards groundfish management measures (those that decrease regulatory discarding and improve safety at sea), others may worsen negative feelings (those that decrease occupational opportunities and flexibility).

In general, current industry perceptions about the effectiveness and direction of groundfish management are negative. Constantly changing groundfish regulations and layers of confusing management measures and their disproportional impacts have resulted in a loss of credibility for the Council and NMFS and a loss of faith in the federal fisheries management process. Some industry members are bitter because they feel that regulations are never given time to work before additional ones are implemented. In addition, analyses for numerous actions that the Council has taken since Amendment 5 projected that objectives would be met and that the industry would begin to reap the benefits of its sacrifices. Much of the industry feels that they are still waiting for the opportunity to reap these benefits, yet additional management measures continue to be proposed.

Another development that has affected the industry's faith in the management process is the new reference points proposed for all stocks. NEFSC 2002a adopted new modeling assumptions for assessing the resource and as a result, proposed increasing some biological reference points three-fold. This has created a general perception among the industry that scientists and managers are "moving the goal posts" just as the stocks were rebuilding to target levels and leaves the industry concerned that they will never have the opportunity to experience the benefits of a rebuilt resource. These negative perceptions are coupled with increases in fish abundance and catch rates that the industry reports to be experiencing in many areas and recent discoveries about errors associated with the NEFSC trawl survey.

Measurement: The best tools for measuring this factor include surveys, focus groups, and key informant interviews to gain more information about perceptions about the current management process, management regulations, and the entities involved in the management process. For measurement in this assessment, information was obtained primarily from the Social Impact Informational Meeting Report, the MARFIN Report, McCay and Cieri 2000, and the ME DMR Groundfish Regulation Impact Survey in 2002. Additional information relative to this factor was gained from the Council's Advisory Panels, scoping meetings, public hearings, Committee and Council meetings, and discussions with other community groups and panels.

Assessment of this factor should address the following questions:

- In comparison to the no action alternative, is the proposed action likely to result in the formation of negative attitudes by affected parties?
- If negative attitudes are predicted to result, are they likely to compromise the effectiveness of the proposed action?

5.6.2.2 Social and Community Impacts of Amendment 13 Alternatives

5.6.2.2.1 General Impacts of Measures Under Consideration

This section provides a discussion of the social impacts that are most likely to result from DAS modifications, area closures, trip limits, gear restrictions, hard total allowable catches (TACs), and special access programs, six of the management tools that form the basis for most of the alternatives under consideration in this amendment. The unique aspects of each of the alternatives are discussed in subsequent sections of this assessment.

5.6.2.2.1.1 DAS Modifications

In comparison to the status quo alternative (Amendment 7 DAS, 88 Fleet DAS, Individual DAS), Alternatives 1A, 1B, 2A, 2B, 3 and 4 specifically propose modifications to DAS. Alternatives 4A uses quota management to attain mortality reductions. Alternatives 2A, 2B, 3 and 4 incorporate the DAS baseline that was implemented in the Interim Action (settlement agreement), and freeze the baseline at settlement agreement levels. Alternatives 1A and 1B use the pre-settlement agreement average days at sea, and reduce total days at sea used to 28,400 and 41,050 days respectively. These translate into reductions of 55% and 35% respectively for each vessel. Coincidentally, 41,050 days is approximately what was used in fishing year 2002. The DAS modifications considered in this amendment also included changes in the way that DAS are counted in the Southern New England mid-Atlantic regulated mesh area under Alternative 1. There are also measures included which could be part of any of the alternatives chosen to address capacity and remove latent days at sea.

The EA for the Interim Action includes analysis of the settlement agreement DAS allocations (maximum DAS usage in one year from FY96-00; minimum 10 DAS allocation) and a 20% reduction from the allocation baseline. All of the EA measures were effective during the 2002 fishing year and are included in some of the alternatives under consideration in Amendment 13.

Reductions in DAS are proposed in the rebuilding alternatives and by the capacity alternatives. The proposed action will change the way DAS are allocated by using a baseline different than that used in the court settlement. In addition, the use of allocated DAS wil be restricted, with only 60 percent available to fish on all stocks. The remaining 40 percent are limited ot special access programs; half of those may be available in the future to target healthy stocks. Of the original alternatives, only Alternatives 1A and 1B require a days at sea reduction beyond what was implemented by the interim agreement. Further reductions in DAS beyond what was implemented in the settlement agreement would affect vessels and communities which are more active in the groundfish fishery as demonstrated by their percentage of allocated days at sea actually used. In other words, vessels which use close to 100% of their allocated days would be impacted more by a cut in allocated days at sea than vessels which only used 50% of their days at sea. Examples of communities where these highly dependent groundfish vessels reside include primary communities like Portland ME and New Bedford/Fairhaven MA. Communities where vessels reside that are not as dependent on groundfish include Upper Mid Coast 1 ME, Lower Mid Coast ME, Eastern RI, Northern Coastal NJ, and other similar groups.

Changes in the way that DAS are counted can sometimes equate to DAS reductions. This Is not part of the proposed action. If DAS are counted at a 1.5:1 rate year-round in the inshore Southern New England/Mid-Atlantic regulated mesh area, for example, vessels that are able to fish only in that area effectively receive a further reduction in the DAS available for them to use. For vessels that may be able to access other areas to fish at a 1:1 DAS counting rate, it is likely that they will move to those areas where the regulation may not impact them. This could be farther from shore, possibly compromising their safety.

The proposed action implements restrictions on how DAS can be used. Sixty-percent of allocated DAS can be used to target any stock, while the remainder can only be used to target healthy stocks. In effect, the number of DAS that can be used to target any stock has been reduced from over 71,000 to about 41,000. This is expected to reduce the number of DAS used by forty to fifty percent compared to FY 2001. At the same time, however, the proposed action has created an opportunity to target healthy stocks under specific programs. The use of these Category B DAS can be expected to mitigate some of the impacts of the overall DAS reduction.

Social impacts of DAS reductions tend to be more far-reaching and long-term in nature than social impacts from other management measures like trip limits, gear restrictions, and seasonal area closures. They tend to have the most significant impacts on *disruption in daily living* and *changes in occupational opportunities and community infrastructure*, although they also can affect *safety*. They result from direct reductions in groundfishing opportunities and revenues for vessels that are most active in the fishery. Reductions in groundfishing opportunities through the loss of DAS also compromise vessels' flexibility and can have direct impacts on fishing activity within a port, consequently impacting the shoreside facilities that are dependent on the affected vessels. Other impacts of DAS reductions include increased uncertainty and instability in the fishery and/or community; problems finding and keeping crew members on a year-round basis; social impacts related to family and business financial problems; overall increased stress at the individual, family, and community level; and reductions in perceptions about job satisfaction.

At the social impact informational meeting in New Bedford, one large vessel crew member indicated that individual DAS reductions have complicated fishing schedules, eliminated predictability, and significantly limited income potential. As a crew member, he has sought employment on other vessels because his primary vessel is tied up at the dock for 50% of the year. A vessel owner commented that the DAS reductions converted year-round businesses that relied on groundfish in New Bedford to seasonal operations and that this has had significant impacts on the fishing families as well as other support businesses in the community. Another vessel owner's wife characterized the social impacts of the DAS reductions as "twice as much husband, half as much pay."

At the social impact informational meeting in Portland, one vessel owner remarked that DAS restrictions affected every sector of the Portland fleet: the big boats lost 50% or more of their groundfish opportunities, and gillnetters and smaller vessels were left with few alternatives except for the hope of a decent shrimp season for smaller draggers. Larger boats are trying to maximize returns from their DAS by fishing most or all of their DAS in the winter when prices are better. This again increases concerns about safety.

Indirect negative social impacts resulting from DAS reductions relate to adaptations that vessels make to compensate for reduced opportunity and reduce income, which can oftentimes increase their risk-taking and compromise their safety at sea. As income is reduced, some fishermen will try to minimize their operating costs in order to stay viable, sometimes reducing or eliminating crew, especially on smaller vessels. More owners of smaller vessels could be forced to fish alone for some or all of the year. Vessels may also try to maximize their remaining DAS by fishing during the winter when prices are usually better. Winter weather is more extreme and less predictable, increasing dangers that fishermen may encounter.

DAS reductions were cited as having been difficult for the Boston fleet and the dependent support services in the community to adapt to because the fleet is not highly diversified and historically depended primarily on groundfish. DAS reductions have precluded year-round fishing opportunities; now, most vessels from Boston fish most or all of their DAS during the winter and tie-up their vessels for 3-5 months. This has negative impacts on the economy of the shoreside support services that depend on year-round income to cover the costs of maintaining their businesses.

In addition, the disproportionate impacts of DAS reductions can create perceptions of inequity, which often exacerbate social impacts occurring in communities involved in groundfishing harvesting. Some people think that DAS allocations from Amendments 5 and 7 were unfair and created inequities and tensions between sectors involved in the fishery. Those who switched from groundfish to other fisheries with the decline of the groundfish stocks feel that they were punished by not receiving their true historical allocation of DAS. Some fishermen view DAS allocations as unfair because those who depend most on the fishery were impacted the greatest, while others who never depended on the fishery were allowed to potentially increase their effort eighty-eight fold (88 Fleet DAS were allocated to any vessel that could prove one pound of groundfish landings). Many fishermen feel that they have sacrificed more than their share to rebuild the resource and are concerned about their future ability to realize the benefits of their sacrifices. Six years later, this amendment includes alternatives that propose to reduce used DAS by another 50% and 65%. Similar to Amendments 5 and 7, this measure will again significantly affect those who are most active in and dependent on the multispecies fishery. It is likely that if implemented, reductions as large as 50% and 65% will cause significant economic dislocation in most of the communities involved in groundfishing identified in the Affected Human Environment.

Reductions in allocated DAS proposed in the capacity alternatives have the potential to exacerbate problems associated with the disproportionate impacts of DAS reductions. Vessels that stand to lose the most allocated DAS in this amendment are those that currently have the highest levels of latent DAS. Some proportion of latent DAS in the fishery can be attributable to vessels that are still active, but have shifted their effort from groundfish to other fisheries for many reasons, including groundfish stock declines, market conditions, and opportunities and encouragement to pursue alternative fisheries. As a result, some vessels may feel unfairly treated and disproportionately impacted by the capacity alternatives.

One concern about the long-term impacts of DAS reductions is that once allocated or used DAS are reduced, the DAS that are eliminated from the fishery will never be returned to the vessels. Whether or not this is the case cannot be predicted at this time, but it should be noted as a serious concern relative to long-term social and community impacts of DAS reductions. As noted in the report from the social impact informational meetings, losses of shoreside support infrastructure like cutting houses, ice facilities, processing facilities, and other important services have been experienced in communities throughout the region. While these losses may be due in part to external factors, additional losses will be experienced in some communities that depend on the groundfish fishery if DAS are further reduced by large amounts in this amendment. The long-term concerns relate to the ability of the community to remain actively involved in the groundfish fishery and the ability of the community to support increased participation in the fishery as the stocks continue to recover and support larger yields. This is a significant concern for communities that are marginally involved in the fishery at this time (northern Maine and southern New England communities).

Another important concern is the potential for increased conflicts between user groups resulting from DAS reductions. If DAS are reduced significantly in this amendment or if this amendment changes the way that DAS are counted, it is possible that vessels that historically fished offshore will fish closer to shore to minimize steam time and maximize their DAS usage. This could mean that larger vessels from Gulf of Maine ports that may traditionally fish on Georges Bank will instead fish in the Gulf of Maine to save the DAS that they lose from their steam time to Georges Bank. Conflicts between user groups were identified during the social impact informational meetings (big boats/little boats, Individual DAS/Fleet DAS) and could intensify as a result of adaptations that vessels make to DAS modifications. The vessels likely to make these kinds of adaptations are the larger vessels and those with Individual DAS permits since Individual DAS vessels are currently using most or all of their DAS. Conflicts between user groups can exacerbate intra- and inter-community conflicts, create additional perceptions of inequity, and weaken overall cohesion within communities involved in groundfish harvesting.

The economic impacts of DAS reductions that are being considered in this amendment are discussed in section 5.4.4. Certainly the most significantly impacted vessels from an economic perspective will be those that currently use most or all of their DAS. Many of these vessels possess Individual DAS permits. Similarly, the most significantly impacted communities will be those that currently depend on vessels that use most or all of their DAS and communities that include a relatively large percentage of Individual DAS vessels.

The following table provides percentages of the total multispecies permit holders homeported in the communities of interest that possessed Individual and Fleet DAS permits in the 2000 fishing year. When combined with the information presented in section 5.4.4, it becomes possible to deduce which community groups are likely to be most significantly impacted by reductions in used DAS proposed under alternatives 1a and 1b.

HOMEPORT COMMUNITY GROUP	%Individual Multispecies Permits Within Group (number of permits)	%Fleet Multispecies Permits Within Group (number of permits)	Total Number of Multispecies Permits Homeported in Group
Portland	29.6% (24)	46.9% (38)	81
Portsmouth	10.7% (6)	51.8% (29)	56
Gloucester	6.9% (17)	46.8% (116)	248
Boston	23.3% (7)	37.5% (12)	32
Chatham/Harwichport	0% (0)	43.6% (79)	181
New Bedford/Fairhaven	22.2% (53)	21.3% (51)	239
Point Judith	1.6% (2)	56.5% (70)	124
Eastern Long Island	0% (0)	41.7% (90)	216
Upper Mid-Coast 1, ME	5.6% (3)	50% (27)	54
NH Seacoast	1% (1)	43.5% (40)	92
South Shore, MA	1.2% (2)	39.8% (68)	171
Provincetown	2.8% (1)	47.2% (17)	36

Table 335 – Distribution of Multispecies Permit Holders in FY00 that were Homeported in the Communities of Interest

Note that Lower Mid-Coast 1 ME, Eastern RI, and Northern Coastal NJ are not included in the above table. All three of these community groups are assumed to exhibit patterns in multispecies permits similar to Upper Mid-Coast 1 ME and Eastern Long Island.

Portland, Boston, and New Bedford are homeports to the largest percentages of vessels that have Individual DAS permits, use more of their allocated DAS, and will be most impacted by the large-scale reductions in DAS proposed in Alternatives 1a and 1b. These ports are followed by Chatham/Harwichport, Provincetown, Gloucester, the NH Seacoast, and Portsmouth, which exhibit a relatively high dependence on the multispecies fishery and are homeports to a significant number of active Fleet DAS vessels. Communities like Eastern Long Island, Point Judith, Eastern RI, and Northern Coastal NJ are currently less dependent on the groundfish fishery and are likely to be impacted by the DAS allocations through the loss of flexibility and the opportunity to pursue the groundfish fishery as an alternative to other fisheries.

B DAS

The identification of programs to use Category B DAS is intended to help mitigate the social and economic impacts of the measures needed to rebuild overfished stocks. The use of Category B DAS distinguishes between B reserve DAS - only used in special access programs (SAP) (e.g., closed areas) - and regular B DAS used to target healthy. Two of the proposed SAPs are located offshore and target resources in CA II. Smaller vessels are less likely to have the capacity to steam such a distance and may not find the use of DAS coupled with operating costs and safety risks worth the effort. Conversely, the CA I SAP for hook gear is closer to shore and may provide an opportunity for smaller, selective hook gear to use Category B (reserve) DAS. Massachusetts vessels have easier access to this SAP.

Future programs to use Category B (regular) DAS will be limited to targeting healthy stocks. Present stock conditions suggest that there may be more opportunities for these programs on Georges Bank, given the status of GB haddock, yellowtail flounder, and winter flounder. There are almost no opportunities for these programs in the southern New England area given the status of SNE/MA yellowtail flounder and SNE/MA winter flounder. Within the Gulf of Maine, there may be limited opportunities for programs to target GOM haddock and pollock. For example, there may be an opportunity for a hook gear SAP in the WGOM closed area analogous to that in CA I.

5.6.2.2.1.2 Area Closures

Area closures are proposed throughout the alternatives under consideration in the form of additional and/or modified year-round and seasonal closures. Area closures are used as a management tool in the alternatives to address rebuilding requirements as well as the measures to minimize adverse impacts on habitat. In the alternatives to address rebuilding requirements, most proposed area closures have been developed to address fishing mortality of Gulf of Maine or Georges Bank cod, although some are proposed to address fishing mortality reductions across many groundfish stocks.

The recently implemented Interim Action (settlement agreement) implemented modifications to area closures, the impacts of which also must be considered in this social impact assessment. The EA for the Interim Action includes analysis of the settlement agreement year-round area closures (addition of Cashes year-round) and modifications to seasonal closures (124-125 open Jan-Mar; 80, 81, 118-120 closed May). All of the EA measures were effective during the 2002 fishing year and are included in some of the alternatives under consideration in Amendment 13. Only Alternative 4A reverts back to the pre-settlememt agreement area closures. The proposed action will maintain the year round and seasonal closed areas adopted under the settlement agreement.

The continuation of the Cashes closure on a year-round basis is being considered in all of the Amendment 13 alternatives, with the exception of 4A. Cashes Ledge is an offshore area (compared to other areas in the Gulf of Maine that are proposed for closure), and the vessels and communities that will be most impacted by a year-round closure on Cashes are those that depend on it for fishing during some or all of the year. There is an active gillnet fleet that fishes on Cashes during some part of the year. If possible, these vessels will be forced to relocate their operations. On the other hand, this area will have been closed year-round in the 2002 fishing year, so some adaptations may have already been made by vessels that fish in this area.

In general, two categories of fishing vessels will be most affected by changes to the area closures: (1) vessels from communities involved in groundfish harvesting directly bordering the proposed additional area closures, and (2) vessels from other communities that have traditionally accessed the proposed additional closed areas to fish. Affected vessels from both categories include not only those vessels that fish for Gulf of Maine or Georges Bank cod, but also those vessels that fish for other species like flatfish or scallops. Of the SIA factors under consideration, area closures tend to produce the most significant impacts on *safety* and *disruption in daily living*, although impacts on *occupational opportunities* and *formation of attitudes* can also be expected.

The vessels in Category (1) will be the most directly affected by additional inshore and rolling area closures because the area closures border on the coastlines of their communities and, in some cases, extend up to 80 or 100 miles offshore for a period of time. For the communities of interest in the Gulf of Maine, these vessels are primarily based in Gloucester, Portland, Portsmouth, the NH Seacoast, Provincetown, and the South Shore of Massachusetts. For the communities of interest in Georges Bank, these vessels are primarily based in Chatham/Harwichport.

Within this category of affected vessels, smaller vessels (less than 50 feet) will be at a greater disadvantage to adjust to the regulations because of their inability to travel beyond the area closures to fish. Medium and larger-sized vessels will undoubtedly be constrained and inconvenienced, but the physical characteristics of these vessels may allow them to sustain some level of offshore fishing activity during the time period of closure. A majority of the vessels in question, especially those from Gloucester, Chatham/Harwichport, Portsmouth, the NH Seacoast, Provincetown, and the South Shore are relatively smaller-sized vessels and may be forced to seek alternatives to fishing for multispecies due to the closures. This held true for the inshore area closures implemented through Frameworks 25, 26, 27, 31, and 33. The communities in which these vessels conduct their fishing activities and are homeported are likely to experience the greatest short-term social impacts resulting from additional area closures proposed in this amendment.

The second category of affected vessels is comprised of vessels that have accessed the proposed additional closed areas to fish for a variety of species and may now be facing closure of these fishing grounds. Although some of the affected vessels in this category include those coming from communities involved in groundfishing bordering the area closures (Category (1)), others come from other communities throughout the region. These vessels, while inconvenienced and limited in terms of their flexibility, may still have the opportunity to fish in other parts of the Gulf of Maine and Georges Bank as well as in other regions, although usually at increased expense. Affected vessels in Category (2) but not in Category (1) are more likely to shift their effort into other areas and perhaps onto other species. The communities in which these vessels conduct their fishing activities and are homeported (New Bedford, Point Judith, and Eastern LI, for example) are less likely to experience short-term social impacts resulting from the additional area closures proposed in this amendment.

There are other sectors of the groundfish fishery that will be affected by additional area closures. Shoreside facilities that supply bait, ice, fishing gear, and other supplies may suffer from a decrease in fishing activity in their communities, especially if vessels in their communities are unable to access fishery resources for a period of time. Greater dependence on fishing for groundfish in communities like Gloucester could ultimately lead to a greater potential for community economic dislocation resulting from the area closures implemented in this amendment. As an example, according to information from the 1990 U.S. Census, Essex County, Massachusetts employs close to 6,000 persons in fishing related businesses (processing, seafood markets, vessel repair, etc.). Support infrastructure in communities such as Gloucester (located in Essex County) is estimated to be at a premium, and very little additional infrastructure could be lost without having a major impact in the ability of the fleets in these communities to operate (Aguirre International 1996).

Loss of income and displacement from the fishery are likely to result in the short-term from additional area closures, and these losses are likely to be most significant in communities like Portsmouth, the NH Seacoast, Gloucester, the South Shore of MA, Provincetown, and Chatham/Harwichport MA. In extreme cases, the need for financial assistance as a result of loss of occupational opportunities, when combined with the perception of lowered social status resulting from decreased income, can often result in lowered self-esteem and negative impacts on job satisfaction. These social impacts are often consequences of any management plan directed at reducing exploitation. They also tend to result from alternatives that include either large-scale, long-term area closures or nearshore area closures that preclude opportunities for smaller vessels.

Some area closures proposed in the Amendment 13 alternatives may require that vessels find new fishing grounds and/or travel farther to fish. The potential need to spend more time at sea as a result of Amendment 13 area closures may produce negative social impacts. In fact, length of time at sea has been cited as an important characteristic affecting job satisfaction because of the amount of time fishermen are required to spend away from their families and communities and because of the potential for smaller vessels to compromise their own safety to maintain income during the closure time (Pollnac and Littlefield 1983).

To summarize, the area closures proposed in Amendment 13 will require fishermen and their respective communities to adjust to the regulations aimed at rebuilding commercial groundfish stocks and minimizing adverse impacts on habitat. How these adjustments will affect individuals, their families, and their communities varies with a number of factors, such as their dependence on Gulf of Maine or Georges Bank cod and other groundfish species as well as their ability to increase the value of a reduced catch or to shift effort to other fisheries in order to maintain a year-round stream of revenues.

The proposed action continues the year round and seasonal closed areas adopted by the FW 33 settlement action.

5.6.2.2.1.3 Trip Limits

In comparison to the no action alternative (400/4,000 for GOM cod; 2,000/20,000 for GB cod; no trip limits for SNE or CC/GOM yellowtail):

- Increases to the GOM cod trip limit were proposed for all alternatives, with the exception of 4a, to reduce regulatory discards without compromising fishing mortality.
- Reductions to the GB cod trip limit were considered in Alternatives 2a and 2b to reduce fishing mortality.
- New trip limits are being proposed for Southern New England/mid-Atlantic yellowtail flounder in all alternatives with the exception of 4a.
- A 50-pound trip limit is being proposed for Cape Cod/Gulf of Maine yellowtail flounder in Alternative 2a and 2b. The yellowtail trip limit for Cape Cod/Gulf of Maine yellowtail flounder is the same as Southern New England/mid-Atlantic yellowtail in alternatives 1a and 1b. There are no trip limits for Cape Cod/gulf of Maine yellowtail in alternatives 3 and 4.
- The Haddock trip limits are the same as currently exist.

The proposed action:

- Increases the GOM cod trip limit to 800 lbs/4,000 lbs
- Reduces the GB cod trip limit to 1,000 lbs/10,000 lbds for most vessels, with a seasonal limit for hook gear.
- Adopts a trip limit for CC/GOM yellowtail flounder and SNE/MA yellowtail flounder. While the amounts are the same as implemented in the settlement agreement, the months are different.

The recently implemented Interim Action (settlement agreement) implemented modifications to trip limits, the impacts of which also must be considered in this social impact assessment. The EA for the Interim Action includes analysis of the following changes to trip limits: 200 pounds for open access handgear vessels; 250 pounds Mar-May and 750/3,000 pounds June-Feb for Southern New England yellowtail founder; and 500/4,000 pounds for GOM cod. All of the EA measures were effective during the 2002 fishing year and are included in some of the alternatives under consideration in Amendment 13.

Trip Limits are most likely to affect *regulatory discarding* and *formation of attitudes*. In general, trip limits can affect the structure of a fishery. If the trip limit is set very low, the inshore sector of the fleet can sometimes manage to fish economically, while the offshore sector of the fleet cannot cover trip expenses to direct fishing effort on the species managed by the trip limit. This can change the structure of revenues generated in the fishery and can ultimately change the long-term structure of the fishery itself. These types of outcomes, however, have not been evident to a large extent in the GOM cod fishery because trip limits have been set too low for most vessels to target GOM cod.

Instead, social impacts have resulted because the trip limits themselves hold a socially-undesirable characteristic – *regulatory discarding*. The impacts of regulatory discarding are discussed in Section 5.6.2.1.1.

Based *only* on the likelihood of reducing regulatory discarding, the Gulf of Maine cod trip limits under consideration rank as follows:

No Action	**400 pounds per day/4,000 pounds per trip**	(LEAST LIKELY)
Alternatives 2a, 2b and 3	500 pounds per day/4,000 pounds per trip	

Alternative 1/Proposed Action 800 pounds per day/4,000 per trip (MOST LIKELY)

Different trip limits for cod on Georges Bank and in the Gulf of Maine also have created perceptions of inequity between some sectors of the fishery. Currently, vessels can land 2,000 pounds per day/20,000 pounds per trip when fishing on Georges Bank and 400 pounds per day/4,000 pounds per trip when fishing in the Gulf of Maine. Although they are separate stocks of cod and there are many reasons for different trip limits, codfish are marketed similarly no matter where they are caught (sometimes prices may vary depending on how they are caught). Fishermen in the Gulf of Maine may be disadvantaged in terms of the fresh fish market for cod. Moreover, larger vessels from Gulf of Maine ports may be able to fish on Georges Bank and land more cod, increasing perceptions of inequity in some communities. This often exacerbates conflicts between sectors of the industry, which create social impacts in the form of intra-community conflicts and loss of community cohesion. The proposed action will reduce the difference between these two trip limits.

While the true magnitude of Gulf of Maine cod discards is unknown, any alternative in Amendment 13 that increases the Gulf of Maine cod trip limit to a level that minimizes regulatory discarding without compromising long-term stock recovery will mitigate the social impacts of the trip limit itself. While it may improve perceptions of inequity, creating a significant regulatory discarding problem on GB can be expected to have similar social impacts as the recent low GOM cod trip limits. This would be a likely result for both day boats and trip boats. In addition, if the GB cod trip limits are set too low, disproportionate impacts are likely to be experienced by the hook sector in Chatham/Harwichport, as discussed in the economic impact analysis. The most significant negative social impacts in Chatham/Harwichport and other Cape Cod communities are expected to result from Alternatives 2a and 2b because of a 500 pound per day GB cod trip limit.

5.6.2.2.1.4 Gear Restrictions

In comparison to the no action alternative, several gear restrictions are being proposed in the alternatives under consideration. These include changes in otter trawl codend mesh size; various limits on the number of stand-up and tie-down gillnets that can be used in different areas; requirements to use separator nets, raised footrope trawls, or other gears; limits on the number and size of hooks; and various restrictions on bottom-tending gear to minimize adverse effects on habitat.

The recently implemented Interim Action (settlement agreement) implemented modifications to gear restrictions, the impacts of which also must be considered in this social impact assessment. The EA for the Interim Action includes analysis of the following changes to gear restrictions: 6.5-inch diamond or square mesh codends in the GOM; limits on the numbers of gillnets in the GOM and on GB; limits on the number of hooks to 2,000 in the GOM and SNE and to 3,600 hooks on GB; and 7-inch diamond or 6.5-inch square mesh codends in the newly-defined SNE area. All of the EA measures were effective during the 2002 fishing year and are included in some of the alternatives under consideration in Amendment 13. The impacts of the Interim Action measures are especially important to consider in the context of gear restrictions; in some cases, the no action alternative may have more significant impacts because it would lessen the gear restrictions from the status quo (settlement agreement), leaving fishermen with recently-purchased gear that would no longer be required. The proposed action makes minor changes to gear requirements, but on the whole retains most of the measures adopted by the settlement agreement.

In terms of the SIA factors, gear restrictions affect *changes in occupational opportunities and community infrastructure* and *formation of attitudes* the most, although they can also affect *regulatory discarding* and *disruption in daily living* to a lesser extent. Gear restrictions can compromise business planning for shoreside support services and impose an economic burden on a large number of vessels. The social impacts likely to result from changes to gear restrictions are related to the cost for vessels to comply with and the ability of gear suppliers to adapt to the new gear restrictions. An assessment of the impacts associated with the Interim Action gear restrictions is provided in the Interim Action EA (NMFS 2002).

If a new mesh size is required by the proposed action and not readily available, gear suppliers must order the twine well in advance of the effective date of the new regulation. Gear suppliers have indicated that ordering enough new mesh for the groundfish fleet could take between 3-6 months. In addition, new mesh requirements can sometimes leave gear suppliers with a significant amount of the "old mesh" that may no longer be marketable if it cannot be used in the fishery anymore (or in other fisheries). This results in a more significant loss of income for the gear suppliers.

Gear changes can affect short-term and long-term business planning for gear suppliers and related support services. The uncertainty associated with the implementation of new groundfish regulations necessitates gear suppliers to wait until it is definite that a new gear will be required. It is too risky and too expensive to order new twine or other gear prior to an official announcement of a new regulation. Quite often, this leaves gear suppliers uncertain about the short-term future needs for their business and makes it impossible for them to plan accordingly when developing longer-term business strategies. It is rare that a supplier can plan his/her business needs annually if gear restrictions change on as frequent a basis.

Gear restrictions place an additional economic burden on all affected fishing vessels. The ability to adapt to the new gear regulations will depend on vessels' current economic situation and ability to cover the short-term costs of the gear. If the new gear requirement is significantly different from current gear requirements, it is likely that the most marginal vessels will not be able to cover the costs of the new gear and will be forced to seek alternative fisheries or stop fishing altogether. For the vessels that can cover the short-term costs of the gear, long-term impacts are related more to the loss of revenues from fishing that may occur because of the new gear. For example, vessels are likely to lose some of their catch of species other than groundfish if they are required to fish for groundfish with a larger mesh. Over the long-term, this may result in more significant economic impacts and, ultimately, more severe dislocation of vessels in the fishery.

The magnitude and nature of the impacts of the gear restrictions under consideration in Amendment 13 will depend on the cost of the new gear, the current availability of the new gear, and vessels' choices as to whether or not to fish in the areas where the new gear is required. Some additional discussion of specific gear restrictions proposed in this amendment is provided within the discussion of the various alternatives.

5.6.2.2.1.5 Hard TACs

Hard TACs, or quotas, are being considered as management tools in many of the alternatives proposed in this amendment. Alternatives 2a, 2b and 3 include Hard TACs as backstop measures; Alternatives 4 and 4a represents a Hard TAC approach to managing the groundfish fishery. While the proposed action focuses on effort controls, it does adopt a hard TAC to implement the US/CA Resource Sharing Understanding for cod, haddock, and yellowtail flounder on eastern Georges Bank.

The EA for the recently-implemented Interim Action (settlement agreement) contemplated Hard TACs in the groundfish fishery. Attachment A to the EA described two options for Hard TACs and generally discusses the socio-economic impacts of Hard TACs (NMFS 2002). The EA concluded that the Hard TAC alternative would have the most significant negative impacts of the measures under consideration. The EA document should be referenced for more information and analysis.

Hard TACs have the potential to significantly impact all five SIA factors that have been identified in this assessment: *regulatory discarding*, *safety*, *disruption in daily living*, *changes in occupational opportunities and community infrastructure,* and *formation of attitudes*.

Especially in a multispecies fishery, social impacts of Hard TACs can be a byproduct of several changes in fishing behavior, including derby-style fishing, highgrading, and regulatory discarding. If a TAC is set low enough on a commercially valuable species, it can create a derby or a race for the fish. Derby-style fishing can negatively affect the price for the species and the revenues from the fishery if too much product is put on the market at one time. These negative economic impacts can affect occupational opportunities in the fishery and may impact community infrastructure over the long-term. In addition, derby-style fishing can create unsafe conditions for a vessel or a fleet depending on how competitive the race is and what time of year the fleet is catching the fish.

Once a quota is reached, further landings of the species are usually prohibited. This can create a regulatory discard problem, worsened by the race to fish and a consequently shorter period of time during which the species can be landed. In a multispecies fishery like the groundfish fishery, it is likely that some TACs will be reached, while others will not, allowing some groundfish species to continue to be landed. Depending on the time of year and stock area in question, this could exacerbate problems with regulatory discarding, as the race to fish for the other quota-managed species may force most vessels to continue to fish while discarding the species for which the quota has already been reached.

This outcome is very likely if Hard TACs are set for each stock in the multispecies fishery and if they are combined with other measures in Amendment 13. For example, DAS reductions could increase the race to fish under Hard TACs, as fishermen may try to maximize their remaining DAS by targeting the highest-valued species. This also can lead to highgrading, discarding that occurs when fishermen select only the highest-valued fish to land. For example, if large cod are worth the most, fishermen may discard other marketable sizes to keep only the largest cod, especially if the total quota is low and their opportunities to fish for groundfish are further restricted.

The alternatives that minimize negative social impacts resulting from Hard TACs are likely to be those that include set-asides for bycatch fisheries once the quota in the directed fishery has been reached. This reduces regulatory discarding. Other alternatives with fewer impacts are those that establish Hard TACs for only some of the groundfish species. Negative impacts can be expected to increase proportionately with the number of groundfish stocks managed under Hard TACs.

A Hard TAC management approach does have some potential social benefits. It can provide some stability to the fishing regulations, at least on an annual basis. This can allow for better business planning over the short-term. Assuming that regulatory discards do not increase fishing mortality beyond target levels, Hard TACs have the potential to generate long-term positive social impacts resulting from the ability to meet the conservation objectives of the management program. If Hard TACs are set appropriately and enforced adequately, biological objectives should be met, eliminating the need to increase restrictions on the fishery in the future. This is why some alternatives under consideration set Hard TACs as backstops. Meeting biological objectives ensures an improved revenues stream over the long-term as well.

Since the intent of a Hard TAC is to guarantee that fishing mortality targets will be achieved and management objectives will be met, it is likely that a Hard TAC management program will include fewer other kinds of measures to reduce fishing mortality like area closures, gear restrictions, and DAS modifications (except for programs that use Hard TACs as backstops). To the extent that this is true, the negative social impacts of these other measures can be reduced. It seems reasonable to assume that a Hard TAC management program would eliminate nearshore seasonal area closures in order to provide all vessels with equal access to the resource. This would reduce the impacts associated with derby-style fishing and improve safety, especially for smaller fishing operations that are pursuing the quota.

5.6.2.2.1.6 Special Access Programs

Special access programs are being considered in combination with the alternatives proposed in this amendment. In concept, Amendment 13 endorses the concept of a Special Access Program (SAP) to allow for the establishment of groundfish fisheries that target stocks that can support increased fishing mortality, while avoiding stocks that require reductions in mortality. The positive impacts of these access programs would be from increased groundfish fishing opportunities for vessels that are able to participate in them. Participation could generate additional revenues and help to provide year-round fishing income. Over the long-term SAPs could mitigate some of the negative social impacts resulting from the broader management measures that affect mortality on all stocks like DAS modifications. SAPs are most likely to positively affect *changes in occupational opportunities and community infrastructure*, *disruption in daily living*, and *formation of attitudes*.

There are four SAPS proposed for Amendment 13. Three of those SAPs are on Georges Bank. Two in particular – targeting stocks near CAII – are not likely to be used by small vessels, since they do not have the range to participate safely in these SAPs. One SAP for hook gear vessels in CAI may rovide limited opportunities for small vessels, primarily from Cape Cod and other Massachusetts ports. The fourth SAP will reduce regulatory discards of winter flounder taken while fishing for fluke.

5.6.2.2.2 Impacts of Fishery Program Administration

There are several measures proposed within the administration of the fishery management program (section 3.4) that may generate some social impacts. These measures and their likely impacts are discussed generally below.

FMP Review and Adjustments

The proposed modifications to the periodic adjustment process include revisions to the structure of the Groundfish PDT and establishment of a biennial management adjustment (instead of an annual adjustment). These changes could result in positive social impacts by streamlining and simplifying the management process and improving *formation of attitudes*. In recent times, the Council's annual review/adjustment process and the resulting series of framework adjustments (Framework 25, 27, 31, 33, etc.) have created perceptions of an ever-changing management system that does not allow adequate time for stock recovery to occur before additional, usually more severe, measures are implemented. Adjusting measures less frequently will reduce uncertainty and improve stability for fishery participants. This should allow for better business planning over the short-term. Extending the duration of time between each periodic review and adjustment also would allow measures to affect stocks, ultimately enabling the PDT to more accurately evaluate the impacts of the management measures before recommending additional measures. In the long-term, this approach could lead to more effective management of the multispecies resources.

DAS Leasing

A conservation-neutral DAS leasing program may be a very important mitigating factor for vessels that experience DAS reductions through Amendment 13 and are able to participate in the leasing program. It is possible that the DAS reductions in Amendment 13 will be severe enough for many vessels that they can no longer remain viable in the groundfish fishery. A leasing program offers an option for some vessels to temporarily increase the number of DAS they may fish by leasing the DAS from another vessel that chooses not to fish them. For vessels that are able to participate, this program is likely to mitigate the impacts associated with *disruption in daily living, changes in occupational opportunities and community infrastructure,* and *formation of attitudes.* If a particular community is home to a large number of vessels that can participate, this program may provide for the sustained participation of the community in the groundfish fishery.

The selection of a mechanism to ensure conservation-equivalency is important and may determine the extent to which some vessels are able to participate in the DAS leasing program. Option 1, leasing within categories, limits vessels to leasing DAS that are within similar bounds of size and gear. First, a lessor may not lease DAS to any vessel with a main engine horsepower rating that is more than 20% that of the lessee and may not lease DAS to any vessel that is more than 10% of the lessee vessel's LOA, GRT, and NT. Second, lease agreements would be restricted by gear such that vessels with hook-only permits may lease

DAS only from other hook-only permit holders, trip gillnet vessels may lease DAS only from other trip gillnet vessels with a FY2001 trip gillnet designation, etc. This reduces flexibility within the program and significantly limits the pool of DAS available to a lessor. The largest and most unique fishing vessels are likely to be disadvantaged by this approach; these are the same vessels that may benefit most, economically and socially, from a DAS leasing program. Option 2, calibrating DAS, provides much broader opportunities to match buyers and sellers of leased DAS. Both approaches proposed within Option 2 appear to improve flexibility within the leasing program and maximize the economic and social benefits associated with such a program.

DAS Leasing - Flow

The proposed action will implement a DAS leasing program. The following gives some indication of the possible social impacts from leasing DAS. This analysis is based on part on the predicted outcomes from economic modeling (section 5.4.9.2.7) further aggregated by port, state, and vessel size to give an indication of the differential effects of DAS leasing within the groundfish industry. This analysis should be interpreted as an indication of the *direction* of pressures or trends, rather than a precise estimate of impacts. The economic model itself is highly stylized and makes a number of theoretical assumptions about perfect markets (such as the overall ability and willingness to trade and the full information to do so, and simultaneous execution of all trades) that are not reasonably expected to occur. There are also a number of reasons to expect, based on anthropological perspectives, that such trading will not take place as economic modeling may predict. Anthropological studies have demonstrated repeatedly that for many fishermen and fishing families, a commitment to fishing is based not solely on income or profit maximization but rather on fishing as a way of life (Gatewood and McCay 1988, Gatewood and McCay 1990). Other studies have shown that many fishing businesses are family-run enterprises where income pooling and other forms of resource sharing mitigate against the more traditionally-capitalist assumptions about firms in economic analyses (Doeringer et al. 1986).

The economic modeling assumes that a vessel owner would only lease DAS if the income from leasing is more than the expected income from fishing those DAS; in other words, the impacts from such a leasing arrangement are expected to be positive, or at least no worse than status quo. Given the coupling of this alternative with other alternatives in order to meet conservation neutrality, leasing would at best mitigate the negative impacts from the overall reduction in fishing activity. However, since the income accrues to the owner of the vessel, crew members on vessels that lease DAS away may see a negative impact to income, depending on to what extent the vessel engages in alternative fishing activities (about which the model makes no predictions). Alternatively, crew on vessels that lease DAS in may see positive impacts from increased fishing activity. Changes in landing patterns that could occur with net outflows of DAS from particular ports (as indicated below) could have negative impacts on buyers and processors, depending again on to what extent vessels engage in other fishing activities. Moreover, the social impacts from policy changes extend beyond changes in income. Studies on the social ramifications of ITQ's (though fundamentally different from the policy proposed here since DAS are only leased and not permanently sold) have, for example, pointed to the significant impacts on social relations that stem from the commodification of fishing activity (Pálsson 1998, Pálsson and Helgason 1995). Moreover, such ITQ studies have pointed to the ramifications of changing market shares that enable the domination of particular segments of the industry over others without further protective legislation (McCay 1995, McCay et al. 1995).

In terms of the distributional effects within the groundfish industry, the economic modeling indicates a movement of DAS from large/medium to small vessels (see Table 336). For all size categories, there is a movement to vessels more dependent on groundfish income, though this is more pronounced for the larger vessels. At the state level (Table 337), the influx of DAS is primarily to Massachusetts, which is also the state with the highest groundfish income from the vessels modeled. Maine, though with the second highest income and with income that comes from vessels dependent or highly dependent on groundfish, sees significant loss of DAS. Rhode Island also shows significant loss of DAS. It is therefore expected that the negative impacts (as detailed above) from DAS leasing would be felt most there. At the port level, ports such as New Bedford and Gloucester see a net gain of DAS while ports such as Portland, Point Judith, Newport, and Hampton might see a net loss (Table 338).

Size Class	Groundfish income*	Percent of which comes from dependent vessels	Percent of which comes from highly dependent vessels	Net gain in days-at-sea	Percent of days leased out by dependent vessels	Percent of days leased out by highly dependent vessels	Percent of days leased in by dependent vessels	Percent of days leased in by highly dependent vessels
LARGE	54,281,601	28.8	52.0	-1,771	35.2	30.1	22.1	61.0
MEDIUM	30,187,619	35.8	45.9	-1,585	34.2	23.9	26.0	61.7
SMALL	24,667,130	27.1	62.4	6,095	23.3	45.5	23.0	65.6

* Source: weighout and permit records. Small refers to vessels less than 50 feet in length; medium refers to vessels between 50 and 70 feet in length; and large refers to vessels greater than 70 feet in length. Groundfish income pertains only to vessels included in the economic model. Dependent vessels refers to those earning 50-75% of annual income from groundfish; highly dependent vessels refers to those earning 75-100% of annual income from groundfish (based on 2001 weighout records).

Table 336 - Distribution of Net Flows of Leased DAS, by size of vessel*

State of landing	Groundfish income*	Percent of which comes from dependent vessels	Percent of which comes from highly dependent vessels	Net gain in days-at-sea	Percent of days leased out by dependent vessels	Percent of days leased out by highly dependent vessels	Percent of days leased in by dependent vessels	Percent of days leased in by highly dependent vessels
ME	18,666,203	59.2	38.8	-2,001	66.9	24.3	46.2	53.4
NH	3,773,469	29.4	53.7	799	23.0	42.3	25.5	58.1
MA	76,777,771	23.3	62.6	7,055	22.6	48.3	19.5	69.2
RI	5,967,614	39.9	0.5	-2,001	16.5	2.3	63.4	1.7
NY	3,202,298	22.2	3.2	-844	6.3	2.4	12.5	0.1
NJ	748,095	2.5	0.0	-262	0.1	0.0	16.2	0.0

* Source: weighout and permit records. Does not include states with less than 200 dollars of groundfish income from vessels included in the economic model. Dependent vessels refers to those earning 50-75% of annual income from groundfish; highly dependent vessels refers to those earning 75-100% of annual income from groundfish (based on 2001 weighout records).

Table 337 - Distribution of net flows of leased DAS, by State if Landing*

Port of landing	State of landing	Groundfish income*	Percent of which comes from dependent vessels	Percent of which comes from highly dependent vessels	Net gain in days-at-sea	Percent of days leased out by dependent vessels	Percent of days leased out by highly dependent vessels	Percent of days leased in by dependent vessels	Percent of days leased in by highly dependent vessels
NEW BEDFORD	MA	41,486,508	21.8	61.3	1,659	26.8	34.6	18.7	68.6
GLOUCESTER	MA	18,709,914	11.7	75.1	1,755	14.9	61.7	12.7	73.1
PORTLAND	ME	15,461,837	55.7	42.4	-1,057	69.3	23.3	47.0	52.7
CHATHAM	MA	4,734,080	20.4	72.9	1,870	12.9	32.5	19.5	68.6
BOSTON	MA	4,569,693	77.6	9.6	-433	54.4	29.2	54.9	45.1
POINT JUDITH	RI	4,281,728	29.7	0.4	-1,322	11.8	0.0	54.1	2.2
MONTAUK	NY	2,011,176	25.7	0.3	-37	2.2	0.5	16.4	0.1
HARWICH PORT	MA	1,777,747	2.8	95.6	258	0.5	98.3	8.3	88.3
PORTSMOUTH	NH	1,619,038	36.7	40.6	-6	22.6	29.1	23.8	47.8
NEWPORT	RI	1,502,057	69.6	0.6	-437	37.4	10.7	94.8	0.0
PROVINCETOWN	MA	1,437,719	22.4	68.1	392	17.0	50.7	17.1	69.0
SEABROOK	NH	1,309,124	14.5	79.3	470	19.8	58.3	16.2	83.5
PORT CLYDE	ME	1,140,943	87.0	13.0	-151	89.3	10.7	41.7	58.3
SCITUATE	MA	1,047,175	23.5	57.0	-177	22.6	43.5	7.6	82.0
HAMPTON BAYS	NY	862,372	4.3	10.9	-526	1.4	4.3	3.2	0.0
RYE	NH	725,085	42.9	30.9	313	39.9	55.3	47.5	23.2
PLYMOUTH	MA	676,815	41.4	54.0	553	22.1	69.2	36.0	47.5
ROCKPORT	MA	622,078	30.1	69.8	409	47.8	52.2	14.7	85.3
MARBLEHEAD	MA	608,661	56.3	42.6	395	0.7	79.3	29.5	70.4
SOUTH BRISTOL	ME	523,310	97.7	2.3	-32	100.0	0.0	43.7	56.3
NEWBURYPORT	MA	419,484	81.6	18.4	333	70.7	29.3	60.8	39.2
POINT PLEASANT	NJ	401,744	0.0	0.0	-296	0.0	0.0	0.0	0.0
OTHER BARNSTABLE	MA	377,717	57.6	29.4	-78	39.7	38.1	85.3	14.6
BELFORD	NJ	343,701	5.5	0.0	64	0.4	0.0	16.8	0.0
CUNDYS HARBOR	ME	295,106	90.2	9.3	7	59.8	3.2	99.9	0.1
FREEPORT	NY	235,136	55.2	0.0	-137	27.5	0.0	99.5	0.0
BAR HARBOR	ME	158,417	63.1	36.9	-103	48.8	51.2	.	.
HAMPTON/SEABROOK	NH	120,222	11.4	87.4	22	9.3	89.1	10.8	89.0
NEW HARBOR	ME	119,254	96.1	0.0	-30	61.1	0.0	100.0	0.0
OWLS HEAD	ME	116,934	100.0	0.0	-63	100.0	0.0	.	.
STONINGTON	ME	106,910	19.1	80.9	-132	37.4	62.6	0.0	100.0
TIVERTON	RI	100,109	34.3	0.0	-94	0.0	0.0	99.6	0.0

* Source: weighout and permit records. Does not include ports with less than 100,000 dollars of groundfish income from vessels included in the economic model or fewer than 3 of these vessels landing. Dependent vessels refers to those earning 50-75% of annual income from groundfish; highly dependent vessels refers to those earning 75-100% of annual income from groundfish (based on 2001 weighout records).

Table 338 - Distribution of New Flows of Leased DAS, by port of Landing*

5.6.2.2.3 Impacts of Measures to Control Capacity

For the most part, the social impacts of the measures proposed to control capacity are discussed in Section 5.6.2.2.1.1. The capacity measures propose to eliminate some proportion of unused (latent) DAS from the pool of DAS that can be used in the multispecies fishery. This can be achieved through several strategies: (Alternative 1) Permit Absorption; (Alternative 2) Permit Transfer; (Alternative 3) DAS Transfer; (Alternative 4) Freeze on Unused DAS; (Alternative 5) DAS Reserve.

Alternative 1, permit absorption, allows a permit holder to transfer all permits held to another vessel. This allows permit holders to combine scallop and multispecies limited access permits, with some restrictions in the form of a conservation tax. Under this alternative, the transferring vessel is required to retire from fishing, and all of its limited access permits must be transferred to other limited access permit holders, or they will expire. Retirement from fishing means that a vessel may not participate in any other state or federal open access or limited access fisheries after its permits are transferred. DAS that are acquired by a vessel through a permit transfer and absorption would be made available through a schedule that allows for 20% of the DAS acquired to be reactivated each year. To an extent, this alternative increases flexibility and enhances opportunities in the multispecies fishery for vessels that are able to participate. It may mitigate some of the negative social impacts resulting from DAS reductions and other restrictions in Amendment 13. The social impacts of this alternative for participating vessels may be similar to those associated with a DAS leasing program (Section 5.6.2.2.2). However, the benefits of this alternative are limited to those vessels that may have the financial ability to participate in the program. In addition, the long-term benefits of reducing capacity in the fishery may not be very significant under this alternative.

Alternative 2, permit transfer, allows limited access groundfish permit holders to transfer their multispecies permits to another vessel or vessels, with some restrictions in the form of a conservation tax. Under this alternative, the selling vessel is required to retire from fishing, and all of its limited access permits must be sold to other limited access permit holders, or they will expire. Retirement from fishing means that a vessel may not participate in any other state or federal open access or limited access fisheries after its permits are sold. DAS that are acquired by a vessel through a permit transfer would be made available through a schedule that allows for 20% of the DAS acquired to be reactivated each year. This alternative is very similar to Alternative 1 (permit absorption), so similar impacts can be expected. Benefits may accrue to those vessels that are financially capable of participating in the program. Again, however, the long-term benefits of reducing capacity in the fishery may not be very significant under this alternative.

Alternative 3 allows limited access multispecies permit holders to permanently transfer DAS to other limited access multispecies permit holders, with some restrictions on vessel size and the percentage of active and inactive DAS that can be transferred. Alternative 3 may be adopted as a stand-alone capacity reduction measure, or it may be incorporated into Alternatives 1 or 2. Similar to Alternatives 1 and 2, this approach may have positive impacts for vessels that are financially capable of participating in the program. It could increase DAS available to participating vessels, thereby mitigating the negative impacts of the DAS reductions and other restrictions in Amendment 13. The social impacts of Alternative 3 are expected to be similar to those associated with Alternatives 1 and 2, as well as the proposed DAS leasing program. More significant long-term benefits associated with reducing capacity in the fishery can be expected under Alternative 3 when compared to Alternatives 1 and 2.

Several options are proposed in Alternative 5 so that reductions in fleet capacity are achieved through changing the way that the baseline of DAS is calculated for individual vessels. These measures essentially allocate all limited access multispecies permit holders Individual DAS based on the permit holder's recent level of participation in the groundfish fishery. For the purposes of this assessment, a freeze on unused DAS (Alternative 4) and the DAS Reserve (Alternative 5) equate to reductions in allocated DAS and are discussed in Section 5.6.2.2.1.1.

<u>Effective Effort Baseline</u>

The proposed action adopts a different baseline for determining effective DAS than the baseline used under the court settlement agreement. Under the FW 33 settlement agreement, all vessels received at least 10 DAS, even if they had not fished for groundfish during the qualification period. The proposed action would prevent these vessels from participating either directly by fishing or indirectly by leasing or transferring their DAS.

The distribution of vessels with no DAS under the proposed action can be divided into two overlapping groups of ports (homeports): those having vessels with more than 10 DAS under the court settlement agreement and those having no vessels with more than 10 DAS under the settlement agreement. The ports having a significant number of vessels with more than 10 DAS under the settlement agreement but also having a significant number of vessels that would lose all their DAS under the proposed action are Boston, MA, Gloucester, MA, Barnegat Light, NJ, and Montauk, NY. The other ports in this category have from 0 to 3 vessels that would lose all their DAS (Table 339).

The other category of ports, those with a significant number of vessels allocated only l0 DAS under the court settlement, includes the above ports as well as many ports without any vessels with more than 10 DAS under the settlement agreement. This category includes Boston, Ma, New Bedford, Ma, Portland, ME, Swans Island, ME, Barnegat Light, NJ, Cape May, NJ, Montauk, NY, Point Judith, RI and Newport, RI. In many of the smaller homeports in this group no vessels will have an allocation of DAS. The comparison of overall impacts for the two separate port groupings show that the allocation of no DAS will significantly affect many ports that had vessels allocated fewer than ten DAS (Table 340). Vessels that qualified for less than 10 DAS are likely to be smaller vessels or those that did not have sufficient landings history in the multispecies fishery to qualify for more days. This action removes future potential participation of vessels with less than ten DAS from either directly participating in the fishery or indirectly participating in a lease or transfer program (at least unless Category C DAS are allowed to be used in the fishery). A substantial number of vessels with greater than 10 DAS received an increase in DAS.

CONNECTICUT HOMEPORT STATE	Number of Permits	Number of Vessels with no Change in DAS	Number of Vessels that have increased DAS allocations	Number of vessels with reduced DAS allocations	Number of vessels with zero allocation
GROTON	C	C	C	C	C
NEW LONDON	3	1	1	0	1
NOANK	C	C	C	C	C
NORWALK	C	C	C	C	C
STONINGTON	7	1	0	1	5
	13	3	1	1	8
MASSACHUSETTES HOMEPORT STATE					
ALLENS HARBOR	C	C	C	C	C
AMESBURY	C	C	C	C	C
BARNSTABLE	5	2	2	0	1
BASS RIVER	3	2	1	0	0
BEVERLY	7	3	3	0	1
BOSTON	144	100	24	4	16
BRANT ROCK	5	3	0	1	1
CENTERVILLE	C	C	C	C	C
CHATHAM	45	28	14	1	2
CHILMARK	3	1	1	0	1
DENNIS	6	1	3	1	1
EDGARTOWN	C	C	C	C	C
FAIRHAVEN	8	4	3	1	0
FALL RIVER	C	C	C	C	C
GLOUCESTER	104	61	32	3	8
GREEN HARBOR	8	4	0	2	2
HARWICH	15	10	4	0	1
HULL	3	1	0	1	1
HYANNIS	6	2	3	1	0
LYNN	C	C	C	C	C
MANCHESTER	3	0	3	0	0
MARBLEHEAD	6	3	3	0	0
MARSHFIELD	7	2	1	2	2
MENEMSHA	C	C	C	C	C
NAHANT	C	C	C	C	C
NANTUCKET	3	1	1	1	0
NEW BEDFORD	80	67	10	1	2
NEWBURYPORT	5	3	2	0	0
ORLEANS	8	6	2	0	0
OSTERVILLE	C	C	C	C	C
PIGEON COVE	3	0	3	0	0
PLYMOUTH	5	1	3	0	1
PROVINCETOWN	16	6	8	0	2

Table 339 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits > 10 DAS)

MASSACHUSETTS HOMEPORT STATE	Number of Permits	Number of Vessels with no Change in DAS	Number of Vessels that have increased DAS allocations	Number of vessels with reduced DAS allocations	Number of vessels with zero allocation
ROCKLAND	C	C	C	C	C
ROCKPORT	10	4	3	0	3
SAGAMORE	C	C	C	C	C
SALISBURY	3	2	1	0	0
SANDWICH	6	4	2	0	0
SCITUATE	20	7	8	1	4
SOUTH CHATHAM	C	C	C	C	C
SOUTH YARMOUTH	C	C	C	C	C
SWAMPSCOTT	3	2	1	0	0
TAUNTON	C	C	C	C	C
WELLFLEET	C	C	C	C	C
WEST NEWBURY	C	C	C	C	C
WESTPORT	4	0	1	3	0
WOODS HOLE	4	2	1	0	1
YARMOUTH	C	C	C	C	C
	568	339	148	25	56
MAINE HOMEPORT STATE					
PORT CLYDE	C	C	C	C	C
BEALS	C	C	C	C	C
BELFAST	C	C	C	C	C
BIDDEFORD	C	C	C	C	C
BOOTHBAY	C	C	C	C	C
BOOTHBAY HARBOR	4	2	2	0	0
CAMP ELLIS	C	C	C	C	C
CAPE ELIZABETH	C	C	C	C	C
CAPE PORPOISE	4	1	3	0	0
CUNDYS HARBOR	7	4	2	0	1
FREEPORT	C	C	C	C	C
FRIENDSHIP	C	C	C	C	C
HARPSWELL	C	C	C	C	C
KITTERY	C	C	C	C	C
KITTERY POINT	C	C	C	C	C
MEDOMAK	C	C	C	C	C
MILBRIDGE	C	C	C	C	C
MONHEGAN	C	C	C	C	C
NEW HARBOR	C	C	C	C	C
ORRS ISLAND	C	C	C	C	C
OWLS HEAD	C	C	C	C	C
PEAKS ISLAND	C	C	C	C	C

Table 339 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits > 10 DAS)

MAINE HOMEPORT STATE	Number of Permits	Number of Vessels with no Change in DAS	Number of Vessels that have increased DAS allocations	Number of vessels with reduced DAS allocations	Number of vessels with zero allocation
PORT CLYDE	10	8	2	0	0
PORTLAND	31	26	4	0	1
SACO	3	0	3	0	0
SEBASCO ESTATES	C	C	C	C	C
SOUTH BRISTOL	9	5	4	0	0
SOUTH FREEPORT	C	C	C	C	C
SOUTH PORTLAND	C	C	C	C	C
SOUTHWEST HARBOR	C	C	C	C	C
SPRUCE HEAD	C	C	C	C	C
STONINGTON	3	1	2	0	0
TREVETT	C	C	C	C	C
WEST POINT	C	C	C	C	C
WESTBROOK	C	C	C	C	C
WINTER HARBOR	C	C	C	C	C
YARMOUTH	C	C	C	C	C
YORK	C	C	C	C	C
YORK HARBOR	C	C	C	C	C
	113	70	35	3	56
NEW HAMPSHIRE HOMEPORT STATE					
HAMPTON	8	5	3	0	0
HAMPTON BEACH	C	C	C	C	C
HAMPTON FALLS	C	C	C	C	C
PORTSMOUTH	26	12	12	0	2
RYE	9	4	5	0	0
SEABROOK	12	1	10	0	1
SOUTH HAMPTON	C	C	C	C	C
	60	23	31	1	5
NEW JERSEY HOMEPORT STATE					
BARNEGAT	C	C	C	C	C
BARNEGAT LIGHT	14	3	0	1	10
BELFORD	11	9	1	0	1
BRICKTOWN	C	C	C	C	C
BRNEGAT LIGHT	C	C	C	C	C
CAPE MAY	8	7	0	0	1
EAST BRUNSWICK	C	C	C	C	C
POINT PLEASANT	6	4	1	0	1
TOMS RIVER	C	C	C	C	C
	44	26	2	1	15

Table 339 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits > 10 DAS)

NEW YORK HOMEPORT STATE	Number of Permits	Number of Vessels with no Change in DAS	Number of Vessels that have increased DAS allocations	Number of vessels with reduced DAS allocations	Number of vessels with zero allocation
BROOKLYN	C	C	C	C	C
EAST QUOGUE	C	C	C	C	C
FOX PT	C	C	C	C	C
FREEPORT	C	C	C	C	C
GREENPORT	5	3	1	1	0
HAMPTON BAYS	5	2	2	0	1
ISLIP	C	C	C	C	C
MATTITUCK	C	C	C	C	C
MONTAUK	28	17	4	0	7
NEW YORK	40	28	6	0	6
POINT LOOKOUT	C	C	C	C	C
SHINNECOCK	9	7	0	0	2
SOUTHAMPTON	C	C	C	C	C
THREE MILE HARBOR	C	C	C	C	C
	99	62	17	1	19
RI HOMEPORT STATE					
BLOCK ISLAND	C	C	C	C	C
BRISTOL	C	C	C	C	C
CHARLESTOWN	C	C	C	C	C
GALILEE	C	C	C	C	C
LITTLE COMPTON	3	0	0	2	1
NARRAGANSETT	6	4	2	0	0
NEWPORT	14	8	4	0	2
POINT JUDITH	43	37	2	0	4
PORTSMOUTH	C	C	C	C	C
PROVIDENCE	C	C	C	C	C
SAKONNET POINT	C	C	C	C	C
TIVERTON	4	0	2	1	1
WAKEFIELD	6	4	2	0	0
WARWICK	C	C	C	C	C
WESTERLY	C	C	C	C	C
	88	58	13	6	11
ALL OTHER HOMEPORT STATES					
BATH	C	C	C	C	C
BEAUFORT	C	C	C	C	C
BELHAVEN	C	C	C	C	C
CHINCOTEAGUE	C	C	C	C	C
CRISFIELD	C	C	C	C	C
ENGELHARD	C	C	C	C	C
FALLING WATERS	3	2	0	0	1

Table 339 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits > 10 DAS)

ALL OTHER HOMEPORT STATES	Number of Permits	Number of Vessels with no Change in DAS	Number of Vessels that have increased DAS allocations	Number of vessels with reduced DAS allocations	Number of vessels with zero allocation
HATTERAS	C	C	C	C	C
MANNS HARBOR	C	C	C	C	C
NEWPORT NEWS	3	1	1	0	1
NORFOLK	4	1	2	0	1
ORIENTAL	C	C	C	C	C
PHILADELPHIA	5	4	0	0	1
WANCHESE	6	4	2	0	0
WILMINGTON	C	C	C	C	C
	32	18	8	0	6
GRAND TOTAL	1017	599	255	38	125

Table 339 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits > 10 DAS)

CONNECTICUT HOMEPORT STATE	Number of Permits	Number of Vessels that have increased DAS allocations	Number of vessel with reduced DAS allocations	Number of vessels with zero allocation
LEDYARD	C	C	C	C
NEW HAVEN	C	C	C	C
NOANK	C	C	C	C
	4	0	0	4
MASSACHUSETTES HOMEPORT STATE				
ALLENS HARBOR	C	C	C	C
BARNSTABLE	C	C	C	C
BASS RIVER	C	C	C	C
BEVERLY	6	0	0	6
BOSTON	49	1	0	48
BRANT ROCK	C	C	C	C
BREWSTER	C	C	C	C
CHATHAM	9	0	1	8
CHILMARK	C	C	C	C
CUTTY HUNK	C	C	C	C
DENNIS	C	C	C	C
EASTHAM	C	C	C	C

Table 340 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits < 10 DAS)

MASSACHUSETTS HOMEPORT STATE	Number of Permits	Number of Vessels that have increased DAS allocations	Number of vessel with reduced DAS allocations	Number of vessels with zero allocation
EDGARTOWN	3	0	0	3
FAIRHAVEN	7	0	1	6
FALL RIVER	C	C	C	C
FALMOUTH	C	C	C	C
FRANKLIN	C	C	C	C
GLOUCESTER	23	3	1	19
GREEN HARBOR	C	C	C	C
HARWICH	5	0	1	4
HUDSON	C	C	C	C
HULL	4	0	0	4
HYANNIS	C	C	C	C
IPSWICH	C	C	C	C
KINGSTON	C	C	C	C
MANCHESTER	C	C	C	C
MARBLEHEAD	3	0	0	3
MARION	C	C	C	C
MARSHFIELD	C	C	C	C
MENEMSHA	C	C	C	C
NAHANT	C	C	C	C
NEW BEDFORD	21	2	3	16
NEWBURYPORT	5	0	0	5
NORTH WEYMOUTH	C	C	C	C
ORLEANS	C	C	C	C
PIGEON COVE	C	C	C	C
PLYMOUTH	C	C	C	C
PROVINCETOWN	3	1	0	2
ROCK HARBOR ORLEANS	C	C	C	C
ROCKPORT	3	0	0	3
RYE HARBOR	C	C	C	C
SAGAMORE	C	C	C	C
SALISBURY	C	C	C	C
SANDWICH	4	0	0	4
SCITUATE	6	1	0	5
SOUTH BOSTON	C	C	C	C
SOUTH WELLFLEET	C	C	C	C
SOUTH YARMOUTH	C	C	C	C
SUTTON	C	C	C	C
SWAMPSCOTT	C	C	C	C
TAUNTON	C	C	C	C
VINEYARD HAVEN	C	C	C	C
WAREHAM	C	C	C	C
WELLFLEET	C	C	C	C

Table 340 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits < 10 DAS)

MASSACHUSETTS HOMEPORT STATE	Number of Permits	Number of Vessels that have increased DAS allocations	Number of vessel with reduced DAS allocations	Number of vessels with zero allocation
WEST BARNSTABLE	C	C	C	C
WESTPORT	7	0	0	7
WESTPORT POINT	C	C	C	C
WINTHROP	C	C	C	C
WORCESTER	C	C	C	C
YARMOUTH	C	C	C	C
	211	9	8	194
MAINE HOMEPORT STATE				
BAILEY ISLAND	C	C	C	C
BASS HARBOR	C	C	C	C
BATH	C	C	C	C
BEALS	C	C	C	C
BOOTHBAY HARBOR	C	C	C	C
BREMEN	C	C	C	C
BRISTOL	C	C	C	C
BUCKS HARBOR	C	C	C	C
CAPE PORPOISE	C	C	C	C
CHEBEAGUE ISLAND	C	C	C	C
CUNDYS HARBOR	5	2	0	3
EAST HARPSWELL	C	C	C	C
FREEPORT	C	C	C	C
GEORGETOWN	C	C	C	C
HARPSWELL	C	C	C	C
JONESPORT	C	C	C	C
KENNEBUNKPORT	C	C	C	C
KITTERY	3	1	0	2
KITTERY POINT	C	C	C	C
MONHEGAN	C	C	C	C
OGUNQUIT	C	C	C	C
ORRS ISLAND	C	C	C	C
OWLS HEAD	C	C	C	C
PHIPPSBURG	C	C	C	C
PORTLAND	4	0	0	4
ROCKLAND	C	C	C	C
SACO	C	C	C	C
SEBASCO ESTATES	C	C	C	C
SOUTH BERWICK	C	C	C	C
SOUTHWEST HARBOR	C	C	C	C
SPRUCE HEAD	C	C	C	C
SPRUCE HEAD ISLAND	C	C	C	C
STEUBEN	C	C	C	C

Table 340 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits < 10 DAS)

MAINE HOMEPORT STATE	Number of Permits	Number of Vessels that have increased DAS allocations	Number of vessel with reduced DAS allocations	Number of vessels with zero allocation
STONINGTON	3	0	0	3
SWANS ISLAND	4	0	0	4
TENANTS HARBOR	C	C	C	C
VINALHAVEN	3	0	0	3
WELLS HARBOR	C	C	C	C
WEST JONESPORT	C	C	C	C
WEST POINT	C	C	C	C
WESTPORT	C	C	C	C
WINTER HARBOR	3	1	0	2
WISCASSET	C	C	C	C
YORK HARBOR	C	C	C	C
	66	8	1	57
NEW HAMPSHIRE HOMEPORT STATE				
HAMPTON	7	0	0	7
PORTSMOUTH	3	0	0	3
RYE	C	C	C	C
RYE HARBOR	C	C	C	C
SEABROOK	3	0	1	2
	15	0	1	14
NEW JERSEY HOMEPORT STATE				
BARNEGAT LIGHT	4	0	0	4
BELFORD	7	0	0	7
BELMAR	C	C	C	C
BRICK	C	C	C	C
BRIELLE	C	C	C	C
BRNEGAT LIGHT	C	C	C	C
CAPE MAY	5	0	0	5
MANASQUAN INLET	C	C	C	C
POINT PLEASANT	3	0	0	3
POINT PLEASANT BEACH	C	C	C	C
SEA ISLE CITY	C	C	C	C
WARETOWN	C	C	C	C
WILDWOOD	3	0	0	3
	33	0	1	32
NEW YORK HOMEPORT STATE				
ATLANTIC BEACH	C	C	C	C
EAST ISLIP	C	C	C	C
FREEPORT	C	C	C	C
GLEN COVE	C	C	C	C

Table 340 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits < 10 DAS)

NEW YORK HOMEPORT STATE	Number of Permits	Number of Vessels that have increased DAS allocations	Number of vessel with reduced DAS allocations	Number of vessels with zero allocation
HAMPTON BAYS	C	C	C	C
ISLAND PARK	C	C	C	C
LONG ISLAND	C	C	C	C
MASTIC BEACH	C	C	C	C
MATTITUCK	C	C	C	C
MONTAUK	12	0	0	12
NEW YORK	20	0	1	19
POINT LOOKOUT	C	C	C	C
SHINNECOCK	C	C	C	C
WEST SAYVILLE	C	C	C	C
	44	0	1	43
RI HOMEPORT STATE				
BLOCK ISLAND	C	C	C	C
DAVISVILLE	C	C	C	C
GALILEE	C	C	C	C
NARRAGANSETT	C	C	C	C
NEWPORT	5	0	0	5
POINT JUDITH	7	0	0	7
PROVIDENCE	C	C	C	C
SAKONNET POINT	C	C	C	C
SAUNDERSTOWN	C	C	C	C
SNUG HARBOR	C	C	C	C
TIVERTON	C	C	C	C
WAKEFIELD	C	C	C	C
	26	0	0	26
ALL OTHER HOMEPORT STATES				
ATLANTIC	C	C	C	C
AURORA	C	C	C	C
BEAUFORT	C	C	C	C
GOMEZ	C	C	C	C
NEWPORT	C	C	C	C
NEWPORT NEWS	C	C	C	C
NORFOLK	C	C	C	C
OCEAN CITY	4	0	0	4
ORIENTAL	C	C	C	C
PHILADELPHIA	4	0	0	4
ST HELENA	C	C	C	C
SWAN QUARTER	C	C	C	C
WANCHESE	5	0	1	4
WILMINGTON	C	C	C	C
	26	0	2	24
GRAND TOTAL	425	17	14	394

Table 340 - Comparison of Settlement Agreement and Proposed Action Baseline DAS by Homeport (Permits < 10 DAS)

5.6.2.2.4 Impacts of Management Alternatives to Address Rebuilding Requirements

A significant amount of discussion about social impacts already has been presented in this assessment (Sections 5.6.1.3, 5.6.2.1 and 5.6.2.2.1). Discussion of the alternatives in the subsections below is brief and refers to previous sections of this assessment where appropriate.

5.6.2.2.4.1 Proposed Action

The major components of the poroposed action include:

- Categorization of allocated DAS into Category A, Category B (regular) Category B (reserve) and Category C DAS based on effective effort. Category A DAS can be used to target any stock, Category B DAS can only be used to targey healthy stocks. Details for the use of Category B (regular) DAS, outside of special access programs, remain to be developed. Effective effort option 9 is used, with the split of effective effort into A and B DAS set at 60/20/20.
- Year round and seasonal closed areas as adopted by the settlement agreement
- GOM cod trip limit increased to 800 lbs/4,000 lbs
- GB cod trip limit reduced to 1,000 lbs./10,000 lbs, with a seasonal limit for hook gear
- CC/GOM yellowtail flounder trip limit of 250 lbs (May/June and October/November), 750 lbs/3,000 lbs remainder of year
- SNE/MA yellowtail flounder trip limit of 250 lbs (March through June) and 750 lbs/3,000 lbs remainder of the year
- Minor revisions to gear requirements

The proposed action anticipates a large reduction in the number of DAS used to target any groundfish stock. This will reduce opportunities and participation in the fisher by many vessels. The categorization of DAS and identification of opportunities to use B DAS may reduce some of the negative impacts of the DAS reduction. This depends on how successful the Council is in identifying ways to use B DAS outside of special access programs. If the Council is unsuccessful in doing so, then the possibity of using B DAS may be viewed as a sham by some fishermen and their families, and there will eb a negative reaction ot the regulations.

Increasing the GOM cod trip may help reduce regulatory discards. It will also help make each of a limited number of DAS more profitable, helping to mitigate the negative impacts of the DAS reductions.Lowering the GB cod trip limit to a level closer to that of GOM cod may help defuse many of the complaints about the discrepancy between the trip limits for the two stocks. The lower GB cod trip limit could result in increased discards. Analysis of observer nad study fleet data indicate that the limit may be at the right level to reduce mortality without significantly increasing discards. The trip limits on yellowtail flounder will probably increase discards on stocks that have not been subject to a trip limit prior to the settlement action. This will create more negative attitudes concerning the discard levels.

The changes to gear requirements focus on gillnet vessels. Many gillnet fishermen flet the settlement agreement gillnet measures were unfair. The proposed action addresses some (but not all) of those complaints. It increases the number of trip gillnets that can be used on Georges Bank to the same number used in the Gulf of Maine, addressing one perceived inequity. It also removes restrictions on the use of stand-up nets in the GOM, providing a limited opportunity to target healthy roundfish stocks in the winter months.

One of the most contentious elements of the proposed action is adopting Option 9 for the definition of effective effort. This option uses a qualification period of fishing year 1996 through 2001, and adds a requirement that a vessel document landings of regulated groundfish during this period. It is a significant re-shuffling of the DAS allocations authorized under the settlement agreement. By extending the qualification period to 2001, the Council did not use a control date announced in 1999 for evaluating DAS. Some argue that this rewards those who ignored the control date and began fishing after its adoption. Establishing a landings requirment is viewed as prejudicial to those who either did not have access to groundfish during the period because of low stock sizes, or who targeted other species for any reason (better economic opportunities, to allow groundfish to rebuild, etc.). In effect, the use of Option 9 favors current active participants in the fishery while limiting future opportunities for those who were not active during the qualification period. While many active fishermen believe this is more equitable, those who see stocks rebuilding and who cannot fish on them are concerned that they will not be allowed back into the fishery in the future.

5.6.2.2.4.2 No Action Alternative (Not selected)

For the purposes of Amendment 13, the no action alternative is considered to be the regulatory environment which would exist if Amendment 13 is not implemented and the interim action (settlement agreement) expires. In general, this includes the following:

- Amendment 7 DAS allocations and reductions (Individual DAS and 88 Fleet DAS)
- Seasonal/rolling area closures implemented through Frameworks 27, 31, and 33 – effective until modified by future Council action
- Extension of the existing WGOM closed area until modified by future Council action
- Continuation of the triggered closures if 50% of the Target TAC is landed by July 31 (Cashes in November and Blocks 124 and 125 in January)
- Gulf of Maine cod trip limit of 400 pounds per day/4,000 pound trip maximum
- 2001 gear restrictions (6-inch diamond, 6.5-inch square mesh, 80/160 gillnets)
- 2001 recreational fishery restrictions (10 fish recreational bag limit, minimum size of 21-inches for cod, access to Gulf of Maine closed areas with 3-month exemption letter)
- Georges Bank cod trip limit of 2,000 pounds per day/20,000 pound trip maximum
- No trip limits for yellowtail flounder.

Analysis indicates that the no action alternative will not meet the objectives of Amendment 13. The long-term impacts of the no action alternative are therefore likely to be more negative than the long-term impacts of any alternative that can meet the mortality objectives and rebuild the stock to sustainable levels. Under the no action alternative, landings can be expected to decline within a few years, consequently reducing revenues from groundfishing and causing long-term related problems in communities. However, it should be noted that from a social impact perspective, because the Amendment 13 rebuilding alternatives are major in scope and nature, the short-term impacts of any of the Amendment 13 alternatives are likely to be negative and significant when compared to the no action alternative.

The long-term social impacts of taking no action also relate to the probability that future additional action would be necessary to further reduce mortality to rebuild some of the groundfish stocks. If fishing mortality on these stocks remains too high, it is likely that stock biomass would decline, possibly below the threshold levels. The Council would then be required by law to take additional management action, the social consequences of which could be more severe and much larger in scale. Moreover, further declines in stock levels would lengthen recovery periods and, therefore, the period over which the greatest negative social impacts are experienced by affected communities.

A related and important consideration is that in this case, the no action alternative actually represents a step backwards from the current regulatory environment in terms of fishing mortality reductions. The Interim Action implemented through the court order is effective for the 2002 fishing year even though it technically does not represent the no action alternative in this amendment (it represents the status quo). Measures currently effective include significant reductions in DAS allocations through a new baseline; a 20% reduction in DAS; gear restrictions including increased mesh and limits on the numbers of gillnets and hooks; and trip limits on Southern New England yellowtail flounder. While this essentially guarantees that the short-term social impacts of the no action alternative would be positive, any conservation gains from the Interim Action measures would be lost, increasing the likelihood that additional management measures may be necessary in the future.

5.6.2.2.4.3 Alternative 1A (55% Reduction in Used DAS) and 1B (Phase-in of 65% reduction in Used DAS) (Not selected)

The major components of this alternative include:

- Increase in the trip limit for Gulf of Maine cod to 800/4,000.
- An option to maintain the Southern New England yellowtail flounder trip limit implemented in the settlement agreement: 250 pounds Mar-May and 750 pounds June-Feb.
- Reduction in allocated DAS by one of the capacity alternatives
- 50% reduction in used DAS, or phase-in of 65% reduction in used days at sea.
- Seasonal rolling closures.
- Gear restrictions including increased mesh size for trawls and gillnets in some areas and limits on the number of allowable gillnets and hooks.

For measures that were implemented in the settlement agreement, the EA for the Interim Action should be referenced for more detailed information about the social and community impacts.

Relative to other trip limits under consideration, the cod trip limits proposed in this alternative (GOM and GB) are likely to have the least impact on *regulatory discarding*. The social impacts, when compared to the no action alternative, will be positive for the GOM cod trip limit. The GB cod trip limit will have the least impact on regulatory discarding . The GB cod trip limit proposed in Alternatives 2a and 2b is much more likely to have more significant negative impacts.

The previous discussion about SIA factors and DAS modifications should be referenced for more information about the social impacts of DAS reductions proposed in both Alternatives 1 and 1A. If combined with a capacity alternative to reduce DAS allocations, a 55% reduction in used DAS has high probability of causing significant impacts on vessels and most communities in the groundfish fishery. DAS reductions affect the economy of the fishery and have the most significant long-term effect on *changes in occupational opportunities and community infrastructure*. A 35% reduction in the first year of the phase-in of a 65% DAS reduction would yield a similar amount of days to what was used in Fishing year 2002.

5.6.2.2.4.4 Alternative 2A and 2B – Settlement Agreement Days at Sea baseline minus 20% (Not selected)

The major components of this alternative include:

- Settlement agreement DAS baseline minus 20 percent (30% reduction in DAS for GOM vessels).
- Increase in the trip limit for Gulf of Maine cod to 500 pounds per day/4,000 pounds per trip as implemented in the settlement agreement
- Georges Bank cod trip limit of 500 pounds per day/ 4,000 pounds per trip.
- Seasonal Southern New England yellowtail flounder trip limit implemented in the settlement agreement: 250 pounds Mar-May and 750 pounds June-Feb.

- Cape Cod yellowatil Flounder Trip Limit of 50 pounds per trip in statistical areas 514 and 521.
- Potential reduction in allocated DAS by one of the capacity alternatives
- Seasonal and year-round closures.
- Gear restrictions including increased mesh size for trawls and gillnets in some areas and limits on the number of allowable gillnets and hooks.

This alternative allocates days at sea using the settlement agreement baseline, and then reduces them by 20% (30% for GOM vessels). The difference between 2a and 2b is how vessels fishing in the Gulf of Maine are treated. Under alternative 2A, any vessel which fishes in the Gulf of Maine will have their days at sea reduced by 30% from the settlement agreement baseline. Under alternative 2B, vessels will only be able to use 70% of their days at sea in the Gulf of Maine after their 20% reduction is imposed. For measures that were implemented in the settlement agreement, the EA for the Interim Action should be referenced for more detailed information about the social and community impacts.

Relative to other trip limits under consideration, the GOM cod trip limits proposed in this alternative is likely to have a slight positive impact on *regulatory discarding*. The GB cod trip limit essentially is likely to have a large impact on hook vessels fishing out of major Cape ports, and increase regulatory discards on Georges Bank. Hook vessels catch almost exclusively cod, and those that depend heavily on the groundfish fishery will be most affected by the GB cod trip limit

The previous discussion about SIA factors, the impacts of DAS modifications, and the impacts of Alternative 1 should be referenced for more information about the social impacts of the DAS reductions proposed in Alternative 2.

5.6.2.2.4.5 Alternative 3 – Area Management (Not selected)

The area management alternative is intended to provide for development of management measures that are more consistent with fishing activity and resource conditions in a particular area; encourage a greater sense of stewardship, simplify participation by interested parties in the management process, and insure that fishing activity in one area does not adversely affect fishing activity in another area.

The major components of this alternative include:

- Trip limits for GB cod: 2000 pounds per day/20,000 pounds per trip.
- GOM Cod trip limit of 500 ponds per day/4,000 pounds per trip.
- Seasonal Southern New England yellowtail flounder trip limit implemented in the settlement agreement: 250 pounds Mar-May and 750 pounds June-Feb. No retention south of 40N
- Ssettlement agreement DAS baseline with 20% reduction.
- Seasonal and year-round closures.
- Gear restrictions including increased mesh size for trawls and gillnets in some areas and limits on the number of allowable gillnets and hooks.

For measures that were implemented in the settlement agreement, the EA for the Interim Action should be referenced for more detailed information about the social and community impacts.

Relative to the status quo alternative, regulatory discarding should decrease with a higher GOM cod trip limit (500 pounds per day instead of 400). There may still be a perception of inequity between GOM and GB fishermen as the GB cod trip limit will remain at 2000 pounds per day/20,000 pounds per trip.

The settlement agreement EA as well as the previous discussion about SIA factors, the impacts of DAS modifications, and the impacts of Alternatives 1 and 2 should be referenced for more information about the social impacts of the DAS reductions proposed in Alternative 3.

5.6.2.2.4.6 Alternatives 4 and 4A– Quota Management (Not selected)

Alternative 4 and 4A use hard TACs for all stocks in the groundfish fishery. The difference between the two options is that under alternative 4, vessels are allocated days at sea based on the settlement agreement baseline reduced by 20%, while under alternative 4a, vessels have their amendment 7 baseline. Additionally, alternative 4a reverts back to the "no action" seasonal closures, while alternative 4 adopts the seasonal closures proposed under the other 3 alternatives. The social impacts of Hard TACs are discussed in Section 5.6.2.2.1.5.

The major components of this alternative include:

- Trip limits for GB cod: 2000 pounds per day/20,000 pounds per trip.
- GOM Cod trip limit of 500 ponds per day/4,000 pounds per trip.
- Seasonal Southern New England yellowtail flounder trip limit implemented in the settlement agreement: 250 pounds Mar-May and 750 pounds June-Feb. No retention south of 40N (Alternative 4 only)
- **S**settlement agreement DAS baseline with 20% reduction (Alternative 4). Amendment 7 baseline (Alternative 4A).
- Seasonal and year-round closure ("no-action alternative" for alternative 4A).
- Gear restrictions including increased mesh size for trawls and gillnets in some areas and limits on the number of allowable gillnets and hooks.

This alternative has the potential to cause significant short-term and long-term social and community impacts. Immediate economic impacts, loss of employment, and dislocation from the groundfish fishery will disrupt fishing operations, families, and community networks. Long-term impacts will result from loss of fresh fish markets and shoreside support businesses. This has the potential to change the structure and character of the groundfish fishery. This alternative will most negatively affect *changes in occupational opportunities and community infrastructure*. A TAC-management program intended to minimize negative social impacts could set separate hard or target TACs for incidental catch fisheries to reduce regulatory discarding.

5.6.2.2.4.7 Recreational Fishery Measures

In addition to the no action alternative, the recreational fishery restrictions considered in this amendment included:

- Option 1 (not selected): settlement agreement measures – minimum size for cod/haddock 23 inches; 10 fish cod/haddock for private recreational vessels, except 5 cod in GOM December-March; party/charter 10 cod/haddock GOM April-November and 5 cod creel limit in GOM December-March; 3-month or more declaration into party/charter fishery to fish in GOM closed areas
- Option 2 (not selected): 10 cod/trip for private recreational vessels and party/charter vessels in the GOM; minimum size for cod 23 inches and haddock 19 inches; closed season in GOM December-March
- Option 3 (proposed action): 10 cod/person/day for private recreational vessels and party/charter vessels in the GOM; minimum size for cod 22 inches and haddock 19 inches.

The impacts of Option 1 are discussed in the EA for the Interim Action (settlement agreement). Because the options are similar, elements of Options 2 and 3 also are discussed in the EA for the Interim Action. Additional discussion of some of the proposed measures is provided below.

Minimum Sizes
The analysis shows that any increase in the recreational minimum size for cod will have a greater impact on private boat/shore mode anglers than on party/charter vessels. This is because more private anglers fish in state waters, and some states currently allow cod smaller than the federal minimum size to be landed. Recreational anglers from ports in New Hampshire and Rhode Island are therefore likely to be most impacted.

Increasing the recreational minimum cod size should not result in significant negative social impacts. While private anglers are impacted, it is unlikely that they will stop fishing recreationally, especially if they already own boats and/or gear. Their landings will be impacted, and for those who fish for subsistence, this may be a concern. However, most will likely continue to fish under the new minimum size and possibly shift some effort onto other fisheries.

Three-Month or More Declaration to Fish in GOM Closed Areas
For vessels that operate as party/charter vessels on a year-round basis, this measure will have no significant impact. However, it could further reduce opportunity and limit flexibility for vessels that operate as party/charter only seasonally and use DAS to fish commercially during other times of the year. This is an adaptation that some smaller vessels have made in recent years to maintain a year-round business. This measure prevents a party/charter vessel that wants to fish in any of the Gulf of Maine closures from using any DAS to fish for groundfish during its time of enrollment, which could be year-round if the vessel wants to access the western Gulf of Maine closed area. Vessels that take party/charter trips during times when waters adjacent to their communities are closed to commercial fishing could no longer have the opportunity to do so. These vessels may not be able to adapt to this measure by fishing on party/charter trips outside of the closed areas because they cannot safely access the areas outside the closed areas; if they could, they would most likely be fishing commercially.

From 1995-2000, an average of 72.7% of vessels that reported taking party/charter groundfish trips made 100% of their fishing income from party/charter operations. The remaining 27.3% earned income from other fishing activities. About ten percent earned less than 50% of their fishing income from party/charter operations. These vessels could be commercial vessels that are taking party/charter trips to compensate for reduced income from commercial fishing or to maintain a year-round income during times of area closures. The communities most likely to be impacted by this measure are those that are adjacent to Gulf of Maine closure areas and those in which the most party/charter vessels are homeported. These communities are Gloucester and the North Shore of Massachusetts, Portsmouth and the NH Seacoast, southern Maine, and the South Shore of Massachusetts.

Economic Impacts
The economic impacts of the proposed recreational measures are discussed in section 5.4.7. Social impacts from recreational measures are related to economic impacts to the extent that the economic impacts reduce the value or satisfaction derived from taking a recreational trip. For the most part, it is assumed that recreational groundfish fishermen derive more satisfaction from keeping fish than from the sport of catching them. As a result, the social impacts associated with the measures that reduce the ability to keep fish are expected to be more significant than they would in other recreational fisheries where catching fish for sport is more important. These measures include minimum fish sizes and recreational possession limits.

The economic analysis indicates that party/charter vessels will be most affected by the proposed recreational restrictions, especially Option 2, followed by Option 1 and then Option 3. Total losses are predicted to range from $306,000 in sales, $125,000 in income, and 8 jobs under a 25% reduction in trips for Option 3 to $697,000 in sales, $284,000 in income, and 18 jobs under a 25% reduction in trips for Option 2. Since party/charter operations stand to be most affected, the communities that will likely experience the most negative impacts are those with a high proportion of party/charter operations and those whose vessels fish in the GOM. These communities include the NH Seacoast, Gloucester MA, and the South Shore of Massachusetts.

5.6.2.2.5 Habitat Alternatives

In addition to the no action alternative, the Council considered the following alternatives to minimize the adverse effects of fishing on habitat in Amendment 13:

- reliance on the incidental benefits of other Amendment 13 measures;
- options for establishing additional closed areas designed to mitigate the impacts of fishing on EFH;
- options for establishing additional closed areas designed to protect important EFH and balance fishery productivity;
- closed areas consistent with the Framework 13 scallop closed area access program;
- prohibition of shrimp trawls, herring mid-water trawls, clam dredges, and pots and traps from the closed areas;
- options for restricting the use of rockhopper and/or roller gear; and
- requirement for all groundfish vessels to use VMS.

The social impacts of the alternatives under consideration to minimize adverse impacts on habitat have been discussed in previous sections of this assessment (Sections 5.6.2.2.1.2 and 5.6.2.2.1.4). In addition, the EA for the Interim Action (settlement agreement) provides information about social and economic impacts associated with various kinds of gear restrictions.

The habitat alternatives are most likely to affect *safety, disruption in daily living,* and *formation of attitudes*. Over the long-term, large-scale area closures can affect *changes in occupational opportunities and community infrastructure*. The social impacts of the habitat alternatives should be considered **additional** to any impacts resulting from the alternatives to address rebuilding requirements and the capacity alternatives.

The most significant social impacts associated with the habitat alternatives are likely to result from options that include the additional year-round closure of inshore areas. Communities with smaller vessels that fish exclusively in the inshore Gulf of Maine have already experienced significant impacts from inshore area closures and stand to be disproportionately impacted from some of the habitat alternatives proposed in this amendment. These communities include Lower Mid-Coast 1 ME, Portsmouth NH, the NH Seacoast, Gloucester MA, South Shore MA, and Provincetown MA, among others.

It is important to note that some of the habitat alternatives will affect more than just groundfish vessels; prohibitions on fishing in closed areas have the potential to affect vessels that fish for shrimp, herring, and other species. The vessels and communities affected by such prohibitions are likely to be the same as those affected by all of the Amendment 13 measures. On an individual-vessel basis, however, these kinds of prohibitions could exacerbate some of the negative impacts associated with Amendment 13 to the extent that they further reduce opportunities in other fisheries and overall vessel flexibility. Vessels may find it more difficult to adapt to the Amendment 13 measures if they are limited in terms of alternatives to groundfishing.

5.6.2.2.5.1 Alternatives to Minimize Adverse Effects of Fishing on Essential Fish Habitat

Many of the habitat measures considered have limited data with which to evaluate social and community impacts. The one exception is for the proposed habitat protection areas. The impacts of closing these areas on vessel revenue can be bound by analyzing recent landings. Community level analysis is based on port level VTR data that is also aggregated by sub-regions identified by Hall-Arbor et. al., (2001) in New

England's Fishing Communities and by McCay and Cieri (2000) in Fishing Ports of the Mid-Atlantic: A Social Profile. Community and regional impacts are expressed in relative terms to total revenue loss impacts. This analysis estimates the magnitude of revenue impacts in the affected port communities which would have corresponding social impacts.

The impacts of a habitat protected area depend in large part on the level of protection provided. The Council considered four levels of closure. Overall, the relative difference between a Level 1 and Level 3 habitat closure mitigates about 22% of total revenue losses for Alternatives 3a, 3b, and 4 (Table 296). For the Alternative 5 variants the revenue losses are reduced by as much as 46% (Alternative 5c). Much of this reduction in revenue impact is associated with savings of monkfish gillnet and lobster trap fishery revenues. A Level3 habitat closure would have the largest mitigating effect on Alternatives 6, 10A, and 10B.

Alternative	Level 1	Level 3 (Proposed)	Reduced Impact ($)	Reduction in Loss (%)
3a	23,237,630	18,098,883	5,138,747	22%
3b	22,042,497	17,498,370	4,544,127	21%
4	15,599,271	11,970,233	3,629,039	23%
5a	20,251,311	11,730,565	8,520,746	42%
5b	38,394,041	24,470,730	13,923,311	36%
5c	25,289,695	13,780,403	11,509,291	46%
5d	16,738,994	9,208,996	7,529,998	45%
6	3,990,045	1,436,544	2,553,501	64%
10A	4,162,998	1,345,937	2,817,060	67%
10B (Proposed)	3,768,834	1,570,002	2,198,832	58%

Table 341-Summary of Revenue Impacts by Alternative and EFH Level

Data and Methods

The subregions designated herein were based on several criteria. First and foremost, data particularly on the non-fishing industrial sectors were available only at a county-level. Thus, the subregional impact area designations represent either an individual county or groups of counties within each of the five New England states. Data obtained from Northeast vessel trip reports, Northeast dealer weigh-out slips, Northeast permit applications, and County Business Patterns information on processors were used to classify Subregions that have similar economic networks and fishing-related attributes. In general, these data provided the ability to identify the regional distribution channels of seafood as it flows from harvesters through dealers and finally on to processors in New England. The subregional designations mainly consist of a coastal county or groups of coastal counties, for these are the counties where the majority of the losses accrue and where the harvesters, dealers, and processors reside. However, if it was determined that fish are regularly being sold to dealers and processors in adjacent noncoastal counties, the subregional designations were expanded to account for these transactions. Subregions 2 through 11 show the impact areas considered in the model. Subregion 1 (Downeast Maine) was not included in this assessment as no revenue impacts due to any one of the habitat alternatives were found.

5.6.2.2.5.2 Port and Regional Impacts

The concentration of revenue loss for Level 1 EFH alternatives 3a, 3b, and 4 are localized in the New Bedford, Gloucester, and Cape Cod regions with a minimum of approximately 2/3 of the revenue loss coming from the community of New Bedford. A level 3 closure generally reduces overall revenue losses across ports except for New Bedford for which revenue loss remains constant for both closure levels. This results in an increase in the relative proportion (> 80%) of impact for New Bedford for these alternatives. Smaller impacts were found for the communities of Gloucester followed by Harwichport, and Chatham which were generally lower for level 3 closures. This contrasts with alternatives 5a, 5b, 5c, and 5d for which smaller revenue losses were more evenly distributed across five regions (New Bedford, Gloucester, New Jersey, Cape Cod, and Boston).

ALTERNATIVE 3a											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of Total Value						Sum of Total Value					
Region	Port	Total ($)				Region	Port	Total ($)			
	SCITUATE	52,310	0%	655,890	3%	BOSTON	SCITUATE	0	0%	550,582	3%
	BOSTON	549,876	2%				BOSTON	549,431	3%		
	ALL_OTHER	53,703	0%				ALL_OTHER	1,151	0%		
CAPE	YARMOUTH	86,438	0%	2,426,351	10%	CAPE	YARMOUTH	0	0%	197,483	1%
	ORLEANS	714	0%				ORLEANS	0	0%		
	NAUSET	0	0%				NAUSET	0	0%		
	NANTUCKET	131,520	1%				NANTUCKET	125,657	1%		
	HARWICHPORT	823,339	4%				HARWICHPORT	1,370	0%		
	CHATHAM	1,176,604	5%				CHATHAM	5,155	0%		
	BARNSTABLE	128,874	1%				BARNSTABLE	1,139	0%		
	ALL_OTHER	78,862	0%				ALL_OTHER	64,163	0%		
CTCOAST	ALL_OTHER	98,175	0%	98,175	0%	CTCOAST	ALL_OTHER	97,139	1%	97,139	1%
DEL_MAR	ALL_OTHER	0	0%	0	0%	DEL_MAR	ALL_OTHER	0	0%	0	0%
DOWNEAST	ALL_OTHER	0	0%	0	0%	DOWNEAST	ALL_OTHER	0	0%	0	0%
GLOUCESTER	SALISBURY	7,084	0%	3,111,219	13%	GLOUCESTER	SALISBURY	676	0%	1,449,792	8%
	ROCKPORT	101,080	0%				ROCKPORT	23,147	0%		
	NEWBURYPORT	32,267	0%				NEWBURYPORT	29,438	0%		
	MARBLEHEAD	25,977	0%				MARBLEHEAD	0	0%		
	GLOUCESTER	2,939,124	13%				GLOUCESTER	1,396,532	8%		
	ALL_OTHER	5,687	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	367,220	2%	460,178	2%	LOWER_MID_ME	PORTLAND	355,123	2%	362,727	2%
	CHEBEAGUE_IS.	71,332	0%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	21,626	0%				ALL_OTHER	7,604	0%		
N_CAROLINA	ALL_OTHER	0	0%	0	0%	N_CAROLINA	ALL_OTHER	0	0%	0	0%

Table 342- Revenue Loss Impacts by Port and Region for Habitat Alternative 3a

ALTERNATIVE 3a											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
NEW_BEDFORD	NEW_BEDFORD	14,676,812	63%	15,408,480	66%	NEW_BEDFORD	NEW_BEDFORD	14,676,812	81%	15,047,308	83%
	FAIRHAVEN	731,667	3%				FAIRHAVEN	370,495	2%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	0	0%	102,241	0%	NEW_JERSEY	SHARK_RIVER	0	0%	102,241	1%
	PT_PLEASANT	0	0%				PT_PLEASANT	0	0%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	102,241	0%				LONG BEACH &BARNEGAT_L.	102,241	1%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	0	0%				CAPE_MAY	0	0%		
	BELMAR	0	0%				BELMAR	0	0%		
	BELFORD	0	0%				BELFORD	0	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_YORK	MONTAUK	3,971	0%	3,971	0%	NEW_YORK	MONTAUK	0	0%	0	0%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	0	0%				GREENPORT	0	0%		
	FREEPORT	0	0%				FREEPORT	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NHCOAST	SEABROOK	33,254	0%	673,584	3%	NHCOAST	SEABROOK	18,668	0%	26,001	0%
	RYE	41,756	0%				RYE	813	0%		
	PORTSMOUTH	424,794	2%				PORTSMOUTH	6,481	0%		
	NEWINGTON	169,719	1%				NEWINGTON	0	0%		
	NEW_CASTLE	335	0%				NEW_CASTLE	0	0%		
	HAMPTON	3,726	0%				HAMPTON	39	0%		

Table 342- Revenue Loss Impacts by Port and Region for Habitat Alternative 3a

ALTERNATIVE 3a											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	173,696	1%	186,156	1%	RICOAST	NEWPORT	173,696	1%	186,156	1%
	ALL_OTHER	12,460	0%				ALL_OTHER	12,460	0%		
SOUTH_ME	ALL_OTHER	21,788	0%	21,788	0%	SOUTH_ME	ALL_OTHER	3,006	0%	3,006	0%
UPPER_MID_ME	S.W._HARBOR	64,278	0%	89,367	0%	UPPER_MID_ME	S.W._HARBOR	61,067	0%	76,451	0%
	ALL_OTHER	25,088	0%				ALL_OTHER	15,384	0%		
VIRGINIA	ALL_OTHER	231	0%	231	0%	VIRGINIA	ALL_OTHER	0	0%	0	0%
OTHER	ALL_OTHER	0	0%	0	0%	OTHER	ALL_OTHER	0	0%	0	0%
Grand Total		23,237,630		23,237,630	100%	**Grand Total**		18,098,883		18,098,883	100%

Table 342- Revenue Loss Impacts by Port and Region for Habitat Alternative 3a(cont.)

ALTERNATIVE 3b											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	51,260	0%	647,281	3%	BOSTON	SCITUATE	0	0%	549,750	3%
	BOSTON	549,044	2%				BOSTON	548,599	3%		
	ALL_OTHER	46,977	0%				ALL_OTHER	1,151	0%		
CAPE	YARMOUTH	86,438	0%	2,426,351	11%	CAPE	YARMOUTH	0	0%	197,483	1%
	ORLEANS	714	0%				ORLEANS	0	0%		
	NAUSET	0	0%				NAUSET	0	0%		
	NANTUCKET	131,520	1%				NANTUCKET	125,657	1%		
	HARWICHPORT	823,339	4%				HARWICHPORT	1,370	0%		
	CHATHAM	1,176,604	5%				CHATHAM	5,155	0%		
	BARNSTABLE	128,874	1%				BARNSTABLE	1,139	0%		
	ALL_OTHER	78,862	0%				ALL_OTHER	64,163	0%		
CTCOAST	ALL_OTHER	98,175	0%	98,175	0%	CTCOAST	ALL_OTHER	97,139	1%	97,139	1%
DEL_MAR	ALL_OTHER	0	0%	0	0%	DEL_MAR	ALL_OTHER	0	0%	0	0%
DOWNEAST	ALL_OTHER	0	0%	0	0%	DOWNEAST	ALL_OTHER	0	0%	0	0%
GLOUCESTER	SALISBURY	6,408	0%	1,979,105	9%	GLOUCESTER	SALISBURY	0	0%	872,461	5%
	ROCKPORT	1,689	0%				ROCKPORT	1,664	0%		
	NEWBURYPORT	2,829	0%				NEWBURYPORT	0	0%		
	MARBLEHEAD	18,215	0%				MARBLEHEAD	0	0%		
	GLOUCESTER	1,948,714	9%				GLOUCESTER	870,797	5%		
	ALL_OTHER	1,249	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	367,220	2%	460,178	2%	LOWER_MID_ME	PORTLAND	355,123	2%	362,727	2%
	CHEBEAGUE_IS.	71,332	0%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	21,626	0%				ALL_OTHER	7,604	0%		

Table 343- Revenue Loss Impacts by Port and Region for Habitat Alternative 3b

ALTERNATIVE 3b											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	0	0%	0	0%	N_CAROLINA	ALL_OTHER	0	0%	0	0%
NEW_BEDFORD	NEW_BEDFORD	14,676,812	67%	15,408,480	70%	NEW_BEDFORD	NEW_BEDFORD	14,676,812	84%	15,047,308	86%
	FAIRHAVEN	731,667	3%				FAIRHAVEN	370,495	2%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	0	0%	102,241	0%	NEW_JERSEY	SHARK_RIVER	0	0%	102,241	1%
	PT_PLEASANT	0	0%				PT_PLEASANT	0	0%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	102,241	0%				LONG BEACH &BARNEGAT_L.	102,241	1%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	0	0%				CAPE_MAY	0	0%		
	BELMAR	0	0%				BELMAR	0	0%		
	BELFORD	0	0%				BELFORD	0	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_YORK	MONTAUK	3,971	0%	3,971	0%	NEW_YORK	MONTAUK	0	0%	0	0%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	0	0%				GREENPORT	0	0%		
	FREEPORT	0	0%				FREEPORT	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NHCOAST	SEABROOK	10,235	0%	619,173	3%	NHCOAST	SEABROOK	555	0%	3,651	0%
	RYE	40,943	0%				RYE	0	0%		
	PORTSMOUTH	394,792	2%				PORTSMOUTH	3,057	0%		
	NEWINGTON	169,719	1%				NEWINGTON	0	0%		
	NEW_CASTLE	335	0%				NEW_CASTLE	0	0%		
	HAMPTON	3,149	0%				HAMPTON	39	0%		

Table 343- Revenue Loss Impacts by Port and Region for Habitat Alternative 3b(cont.)

ALTERNATIVE 3b											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	173,696	1%	186,156	1%	RICOAST	NEWPORT	173,696	1%	186,156	1%
	ALL_OTHER	12,460	0%				ALL_OTHER	12,460	0%		
SOUTH_ME	ALL_OTHER	21,788	0%	21,788	0%	SOUTH_ME	ALL_OTHER	3,006	0%	3,006	0%
UPPER_MID_ME	S.W._HARBOR	64,278	0%	89,367	0%	UPPER_MID_ME	S.W._HARBOR	61,067	0%	76,451	0%
	ALL_OTHER	25,088	0%				ALL_OTHER	15,384	0%		
VIRGINIA	ALL_OTHER	231	0%	231	0%	VIRGINIA	ALL_OTHER	0	0%	0	0%
OTHER	ALL_OTHER	0	0%	0	0%	OTHER	ALL_OTHER	0	0%	0	0%
Grand Total		22,042,497		22,042,497	100%	**Grand Total**		17,498,370		17,498,370	100%

Table 343- Revenue Loss Impacts by Port and Region for Habitat Alternative 3b(cont.)

ALTERNATIVE 4												
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	30,144	0%	611,196	4%	BOSTON	SCITUATE	0	0%	546,121	5%
	BOSTON	544,970	3%				BOSTON	544,970	5%		
	ALL_OTHER	36,082	0%				ALL_OTHER	1,151	0%		
CAPE	YARMOUTH	83,969	1%	2,260,519	14%	CAPE	YARMOUTH	0	0%	165,647	1%
	ORLEANS	642	0%				ORLEANS	0	0%		
	NAUSET	0	0%				NAUSET	0	0%		
	NANTUCKET	131,520	1%				NANTUCKET	125,657	1%		
	HARWICHPORT	713,580	5%				HARWICHPORT	1,370	0%		
	CHATHAM	1,158,454	7%				CHATHAM	5,155	0%		
	BARNSTABLE	125,328	1%				BARNSTABLE	1,139	0%		
	ALL_OTHER	47,026	0%				ALL_OTHER	32,326	0%		
CTCOAST	ALL_OTHER	98,175	1%	98,175	1%	CTCOAST	ALL_OTHER	97,139	1%	97,139	1%
DEL_MAR	ALL_OTHER	0	0%	0	0%	DEL_MAR	ALL_OTHER	0	0%	0	0%
DOWNEAST	ALL_OTHER	0	0%	0	0%	DOWNEAST	ALL_OTHER	0	0%	0	0%
GLOUCESTER	SALISBURY	6,408	0%	955,962	6%	GLOUCESTER	SALISBURY	0	0%	471,619	4%
	ROCKPORT	26	0%				ROCKPORT	0	0%		
	NEWBURYPORT	2,829	0%				NEWBURYPORT	0	0%		
	MARBLEHEAD	3,634	0%				MARBLEHEAD	0	0%		
	GLOUCESTER	941,815	6%				GLOUCESTER	471,619	4%		
	ALL_OTHER	1,249	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	380,708	2%	466,357	3%	LOWER_MID_ME	PORTLAND	364,501	3%	366,710	3%
	CHEBEAGUE_IS.	71,332	0%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	14,316	0%				ALL_OTHER	2,209	0%		

Table 344- Revenue Loss Impacts by Port and Region for Habitat Alternative 4

ALTERNATIVE 4											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	0	0%	0	0%	N_CAROLINA	ALL_OTHER	0	0%	0	0%
NEW_BEDFORD	NEW_BEDFORD	9,803,675	63%	10,334,817	66%	NEW_BEDFORD	NEW_BEDFORD	9,803,675	82%	9,979,041	83%
	FAIRHAVEN+`	531,142	3%				FAIRHAVEN	175,366	1%		
	ALL_OTHE R	0	0%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	0	0%	102,241	1%	NEW_JERSEY	SHARK_RIVER	0	0%	102,241	1%
	PT_PLEASANT	0	0%				PT_PLEASANT	0	0%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	102,241	1%				LONG BEACH &BARNEGAT_L.	102,241	1%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	0	0%				CAPE_MAY	0	0%		
	BELMAR	0	0%				BELMAR	0	0%		
	BELFORD	0	0%				BELFORD	0	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_YORK	MONTAUK	3,971	0%	3,971	0%	NEW_YORK	MONTAUK	0	0%	0	0%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	0	0%				GREENPORT	0	0%		
	FREEPORT	0	0%				FREEPORT	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NHCOAST	SEABROOK	9,473	0%	508,618	3%	NHCOAST	SEABROOK	555	0%	3,651	0%
	RYE	23,191	0%				RYE	0	0%		
	PORTSMOUTH	302,751	2%				PORTSMOUTH	3,057	0%		
	NEWINGTON	169,719	1%				NEWINGTON	0	0%		
	NEW_CASTLE	335	0%				NEW_CASTLE	0	0%		
	HAMPTON	3,149	0%				HAMPTON	39	0%		

Table 344- Revenue Loss Impacts by Port and Region for Habitat Alternative 4(cont.)

ALTERNATIVE 4											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	173,696	1%	173,696	1%	RICOAST	NEWPORT	173,696	1%	173,696	1%
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
SOUTH_ME	ALL_OTHER	21,788	0%	21,788	0%	SOUTH_ME	ALL_OTHER	3,006	0%	3,006	0%
UPPER_MID_ME	S.W._HARBOR	61,067	0%	61,700	0%	UPPER_MID_ME	S.W._HARBOR	61,067	1%	61,364	1%
	ALL_OTHER	633	0%				ALL_OTHER	297	0%		
VIRGINIA	ALL_OTHER	231	0%	231	0%	VIRGINIA	ALL_OTHER	0	0%	0	0%
OTHER	ALL_OTHER	0	0%	0	0%	OTHER	ALL_OTHER	0	0%	0	0%
Grand Total		15,599,271		15,599,271	100%	**Grand Total**		11,970,233		11,970,233	100%

Table 344- Revenue Loss Impacts by Port and Region for Habitat Alternative 4(cont.)

ALTERNATIVE 5A											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)Between Reg	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	449,332	2%	2,042,834	10%	BOSTON	SCITUATE	325,518	3%	1,789,248	16%
	BOSTON	1,388,154	7%				BOSTON	1,388,154	12%		
	ALL_OTHER	205,348	1%				ALL_OTHER	75,576	1%		
CAPE	YARMOUTH	5,052	0%	2,182,191	11%	CAPE	YARMOUTH	0	0%	1,085,886	10%
	ORLEANS	160,658	1%				ORLEANS	0	0%		
	NAUSET	152,648	0%				NAUSET	0	0%		
	NANTUCKET	165,174	1%				NANTUCKET	165,174	1%		
	HARWICHPORT	82,404	0%				HARWICHPORT	60,805	1%		
	CHATHAM	1,137,690	6%				CHATHAM	470,254	4%		
	BARNSTABLE	217,545	1%				BARNSTABLE	213,175	2%		
	ALL_OTHER	261,020	1%				ALL_OTHER	176,479	2%		
CTCOAST	ALL_OTHER	60,211	0%	60,211	0%	CTCOAST	ALL_OTHER	56,705	1%	56,705	1%
DEL_MAR	ALL_OTHER	0	0%			DEL_MAR	ALL_OTHER	0	0%		
DOWNEAST	ALL_OTHER	0	0%			DOWNEAST	ALL_OTHER	0	0%		
GLOUCESTER	SALISBURY	32,946	0%	4,203,843	21%	GLOUCESTER	SALISBURY	9,726	0%	2,218,407	20%
	ROCKPORT	249,173	1%				ROCKPORT	123,923	1%		
	NEWBURYPORT	297,845	2%				NEWBURYPORT	275,762	2%		
	MARBLEHEAD	16,930	0%				MARBLEHEAD	0	0%		
	GLOUCESTER	3,598,061	18%				GLOUCESTER	1,808,996	16%		
	ALL_OTHER	8,888	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	322,001	2%	412,340	2%	LOWER_MID_ME	PORTLAND	288,715	3%	293,595	3%
	CHEBEAGUE_IS.	75,834	0%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	14,506	0%				ALL_OTHER	4,880	0%		

Table 345- Revenue Loss Impacts by Port and Region for Habitat Alternative 5a

ALTERNATIVE 5A											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)Between Reg	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	11,347	0%	11,347	0%	N_CAROLINA	ALL_OTHER	11,104	0%	11,104	0%
NEW_BEDFORD	NEW_BEDFORD	4,095,371	21%	4,625,885	23%	NEW_BEDFORD	NEW_BEDFORD	3,064,165	27%	3,068,343	27%
	FAIRHAVEN	217,437	1%				FAIRHAVEN	4,178	0%		
	ALL_OTHER	313,077	2%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	174,046	1%	2,401,541	12%	NEW_JERSEY	SHARK_RIVER	0	0%	1,066,973	9%
	PT_PLEASANT	665,381	3%				PT_PLEASANT	195,215	2%		
	NEPTUNE	92,440	0%				NEPTUNE	0	0%		
	MONMOUTH	59,905	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	65,745	0%				LONG BEACH &BARNEGAT_L.	0	0%		
	HIGHLANDS	81,354	0%				HIGHLANDS	0	0%		
	CAPE_MAY	73,696	0%				CAPE_MAY	73,696	1%		
	BELMAR	4,557	0%				BELMAR	3,429	0%		
	BELFORD	1,142,793	6%				BELFORD	785,956	7%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	41,624	0%				ALL_OTHER	8,677	0%		
NEW_YORK	MONTAUK	95,402	0%	352,835	2%	NEW_YORK	MONTAUK	27,957	0%	178,688	2%
	HAMPTON_BAY	272	0%				HAMPTON_BAY	272	0%		
	GREENPORT	20,028	0%				GREENPORT	20,028	0%		
	FREEPORT	147,637	1%				FREEPORT	84,044	1%		
	ALL_OTHER	89,497	0%				ALL_OTHER	46,387	0%		
NHCOAST	SEABROOK	200,698	1%	1,723,111	9%	NHCOAST	SEABROOK	21,884	0%	250,561	2%
	RYE	578,136	3%				RYE	117,187	1%		
	PORTSMOUTH	800,903	4%				PORTSMOUTH	105,657	1%		
	NEWINGTON	0	0%				NEWINGTON	0	0%		
	NEW_CASTLE	14,227	0%				NEW_CASTLE	0	0%		
	HAMPTON	129,147	1%				HAMPTON	5,833	0%		

Table 345- Revenue Loss Impacts by Port and Region for Habitat Alternative 5a(cont.)

ALTERNATIVE 5A											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)Between Reg	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	135,308	1%	899,929	5%	RICOAST	NEWPORT	75,606	1%	622,059	6%
	ALL_OTHER	764,621	4%				ALL_OTHER	546,452	5%		
SOUTH_ME	ALL_OTHER	399,702	2%	399,702	2%	SOUTH_ME	ALL_OTHER	167,160	1%	167,160	1%
UPPER_MID_ME	S.W._HARBOR	373,586	2%	374,918	2%	UPPER_MID_ME	S.W._HARBOR	373,586	3%	373,586	3%
	ALL_OTHER	1,332	0%				ALL_OTHER	0	0%		
VIRGINIA	ALL_OTHER	63,036	0%	63,036	0%	VIRGINIA	ALL_OTHER	58,472	1%	58,472	1%
OTHER	ALL_OTHER	15,261	0%	15,261	0%	OTHER	ALL_OTHER	7,449	0%	7,449	0%
Grand Total		19,768,983		19,768,983	100%	Grand Total		11,248,237		11,248,237	100%

Table 345- Revenue Loss Impacts by Port and Region for Habitat Alternative 5a(cont.)

ALTERNATIVE 5b											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	219,841	1%	1,481,269	4%	BOSTON	SCITUATE	190,435	1%	1,330,949	6%
	BOSTON	1,107,690	3%				BOSTON	1,106,279	5%		
	ALL_OTHER	153,738	0%				ALL_OTHER	34,235	0%		
CAPE	YARMOUTH	73,196	0%	5,986,713	16%	CAPE	YARMOUTH	0	0%	1,491,945	6%
	ORLEANS	0	0%				ORLEANS	0	0%		
	NAUSET	6,443	0%				NAUSET	0	0%		
	NANTUCKET	213,799	1%				NANTUCKET	177,269	1%		
	HARWICHPORT	1,240,317	3%				HARWICHPORT	263,582	1%		
	CHATHAM	3,827,902	10%				CHATHAM	525,543	2%		
	BARNSTABLE	442,403	1%				BARNSTABLE	415,026	2%		
	ALL_OTHER	182,652	0%				ALL_OTHER	110,524	0%		
CTCOAST	ALL_OTHER	1,348,536	4%	1,348,536	4%	CTCOAST	ALL_OTHER	1,274,305	5%	1,274,305	5%
DEL_MAR	ALL_OTHER	0	0%			DEL_MAR	ALL_OTHER	0	0%		
DOWNEAST	ALL_OTHER	0	0%			DOWNEAST	ALL_OTHER	0	0%		
GLOUCESTER	SALISBURY	46,508	0%	8,718,787	23%	GLOUCESTER	SALISBURY	25,091	0%	3,879,561	16%
	ROCKPORT	1,049,807	3%				ROCKPORT	280,955	1%		
	NEWBURYPORT	521,855	1%				NEWBURYPORT	437,710	2%		
	MARBLEHEAD	439,142	1%				MARBLEHEAD	0	0%		
	GLOUCESTER	6,313,995	17%				GLOUCESTER	3,135,805	13%		
	ALL_OTHER	347,479	1%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	211,395	1%	229,397	1%	LOWER_MID_ME	PORTLAND	207,417	1%	208,370	1%
	CHEBEAGUE_IS.	0	0%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	18,003	0%				ALL_OTHER	954	0%		

Table 346- Revenue Loss Impacts by Port and Region for Habitat Alternative 5b

ALTERNATIVE 5b												
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	0	0%	0	0%	N_CAROLINA	ALL_OTHER	0	0%	0	0%
NEW_BEDFORD	NEW_BEDFORD	12,864,636	34%	14,107,483	37%	NEW_BEDFORD	NEW_BEDFORD	11,759,628	49%	12,259,904	51%
	FAIRHAVEN	886,135	2%				FAIRHAVEN	500,277	2%		
	ALL_OTHER	356,711	1%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	29,246	0%	1,411,729	4%	NEW_JERSEY	SHARK_RIVER	0	0%	679,987	3%
	PT_PLEASANT	309,139	1%				PT_PLEASANT	124,294	1%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	652,382	2%				LONG BEACH &BARNEGAT_L.	196,209	1%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	192,753	1%				CAPE_MAY	192,753	1%		
	BELMAR	78	0%				BELMAR	0	0%		
	BELFORD	25,012	0%				BELFORD	10,260	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	203,119	1%				ALL_OTHER	156,472	1%		
NEW_YORK	MONTAUK	87,964	0%	200,436	1%	NEW_YORK	MONTAUK	66,226	0%	167,240	1%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	8,043	0%				GREENPORT	8,043	0%		
	FREEPORT	1,311	0%				FREEPORT	1,311	0%		
	ALL_OTHER	103,119	0%				ALL_OTHER	91,660	0%		
NHCOAST	SEABROOK	547,265	1%	1,969,487	5%	NHCOAST	SEABROOK	282,929	1%	816,380	3%
	RYE	390,723	1%				RYE	208,597	1%		
	PORTSMOUTH	656,135	2%				PORTSMOUTH	144,678	1%		
	NEWINGTON	0	0%				NEWINGTON	0	0%		
	NEW_CASTLE	63,620	0%				NEW_CASTLE	0	0%		
	HAMPTON	311,743	1%				HAMPTON	180,176	1%		

Table 346- Revenue Loss Impacts by Port and Region for Habitat Alternative 5b(cont.)

ALTERNATIVE 5b											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	71,115	0%	1,299,516	3%	RICOAST	NEWPORT	69,778	0%	1,020,716	4%
	ALL_OTHER	1,228,401	3%				ALL_OTHER	950,937	4%		
SOUTH_ME	ALL_OTHER	391,641	1%	391,641	1%	SOUTH_ME	ALL_OTHER	116,307	0%	116,307	0%
UPPER_MID_ME	S.W._HARBOR	116,568	0%	201,578	1%	UPPER_MID_ME	S.W._HARBOR	116,568	0%	201,578	1%
	ALL_OTHER	85,011	0%				ALL_OTHER	85,011	0%		
VIRGINIA	ALL_OTHER	460,679	1%	460,679	1%	VIRGINIA	ALL_OTHER	458,763	2%	458,763	2%
OTHER	ALL_OTHER	22,393	0%	22,393	0%	OTHER	ALL_OTHER	328	0%	328	0%
Grand Total		37,829,644		37,829,644	100%	Grand Total		23,906,333		23,906,333	100%

Table 346- Revenue Loss Impacts by Port and Region for Habitat Alternative 5b(cont.)

ALTERNATIVE 5c											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	1,155,744	5%	3,362,563	14%	BOSTON	SCITUATE	530,608	4%	2,088, 038	16%
	BOSTON	1,460,933	6%				BOSTON	1,431,061	11%		
	ALL_OTHER	745,886	3%				ALL_OTHER	126,368	1%		
CAPE	YARMOUTH	5,052	0%	2,315,214	9%	CAPE	YARMOUTH	0	0%	1,197,311	9%
	ORLEANS	160,658	1%				ORLEANS	0	0%		
	NAUSET	152,648	0%				NAUSET	0	0%		
	NANTUCKET	165,174	1%				NANTUCKET	165,174	1%		
	HARWICHPORT	79,609	0%				HARWICHPORT	60,805	0%		
	CHATHAM	1,166,227	5%				CHATHAM	494,842	4%		
	BARNSTABLE	217,545	1%				BARNSTABLE	213,175	2%		
	ALL_OTHER	368,300	1%				ALL_OTHER	263,316	2%		
CTCOAST	ALL_OTHER	44,301	0%	44,301	0%	CTCOAST	ALL_OTHER	38,003	0%	38,003	0%
DEL_MAR	ALL_OTHER	0	0%			DEL_MAR	ALL_OTHER	0	0%		
DOWNEAST	ALL_OTHER	0	0%			DOWNEAST	ALL_OTHER	0	0%		
GLOUCESTER	SALISBURY	16,041	0%	9,232,150	37%	GLOUCESTER	SALISBURY	14,214	0%	3,751,990	28%
	ROCKPORT	1,047,879	4%				ROCKPORT	278,003	2%		
	NEWBURYPORT	410,561	2%				NEWBURYPORT	364,253	3%		
	MARBLEHEAD	448,460	2%				MARBLEHEAD	0	0%		
	GLOUCESTER	6,878,152	28%				GLOUCESTER	3,095,519	23%		
	ALL_OTHER	431,056	2%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	325,213	1%	341,026	1%	LOWER_MID_ME	PORTLAND	322,123	2%	324,205	2%
	CHEBEAGUE_IS.	0	0%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	15,813	0%				ALL_OTHER	2,082	0%		

Table 347-Revenue Loss Impacts by Port and Region for Habitat Alternative 5c

ALTERNATIVE 5c											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	11,347	0%	11,347	0%	N_CAROLINA	ALL_OTHER	11,104	0%	11,104	0%
NEW_BEDFORD	NEW_BEDFORD	4,316,049	17%	4,982,753	20%	NEW_BEDFORD	NEW_BEDFORD	3,142,218	24%	3,146,396	24%
	FAIRHAVEN	309,993	1%				FAIRHAVEN	4,178	0%		
	ALL_OTHER	356,711	1%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	174,046	1%	2,401,441	10%	NEW_JERSEY	SHARK_RIVER	0	0%	1,066,873	8%
	PT_PLEASANT	665,381	3%				PT_PLEASANT	195,215	1%		
	NEPTUNE	92,440	0%				NEPTUNE	0	0%		
	MONMOUTH	59,905	0%				MONMOUTH	0	0%		
	LONG BEACH & BARNEGAT_L.	65,745	0%				LONG BEACH &BARNEGAT_L.	0	0%		
	HIGHLANDS	81,354	0%				HIGHLANDS	0	0%		
	CAPE_MAY	73,696	0%				CAPE_MAY	73,696	1%		
	BELMAR	4,557	0%				BELMAR	3,429	0%		
	BELFORD	1,142,693	5%				BELFORD	785,856	6%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	41,624	0%				ALL_OTHER	8,677	0%		
NEW_YORK	MONTAUK	86,428	0%	347,903	1%	NEW_YORK	MONTAUK	65,399	0%	220,172	2%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	20,699	0%				GREENPORT	20,699	0%		
	FREEPORT	147,637	1%				FREEPORT	84,044	1%		
	ALL_OTHER	93,139	0%				ALL_OTHER	50,030	0%		
NHCOAST	SEABROOK	137,643	1%	299,148	1%	NHCOAST	SEABROOK	85,032	1%	166,104	1%
	RYE	80,517	0%				RYE	63,104	0%		
	PORTSMOUTH	65,179	0%				PORTSMOUTH	15,922	0%		
	NEWINGTON	0	0%				NEWINGTON	0	0%		
	NEW_CASTLE	5,705	0%				NEW_CASTLE	0	0%		
	HAMPTON	10,104	0%				HAMPTON	2,047	0%		

Table 347-Revenue Loss Impacts by Port and Region for Habitat Alternative 5c(cont.)

ALTERNATIVE 5c												
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	78,950	0%	914,887	4%	RICOAST	NEWPORT	77,613	1%	783,119	6%
	ALL_OTHER	835,937	3%				ALL_OTHER	705,507	5%		
SOUTH_ME	ALL_OTHER	27,674	0%	27,674	0%	SOUTH_ME	ALL_OTHER	20,142	0%	20,142	0%
UPPER_MID_ME	S.W._HARBOR	373,586	2%	373,586	2%	UPPER_MID_ME	S.W._HARBOR	373,586	3%	373,586	3%
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
VIRGINIA	ALL_OTHER	58,472	0%	58,472	0%	VIRGINIA	ALL_OTHER	58,472	0%	58,472	0%
OTHER	ALL_OTHER	49,740	0%	49,740	0%	OTHER	ALL_OTHER	7,398	0%	7,398	0%
Grand Total		24,762,205		24,762,205	100%	Grand Total		13,252,913		13,252,913	100%

Table 347-Revenue Loss Impacts by Port and Region for Habitat Alternative 5c(cont.)

ALTERNATIVE 5d											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	479,369	3%	1,443,858	9%	BOSTON	SCITUATE	304,226	3%	1,034,009	11%
	BOSTON	635,905	4%				BOSTON	635,460	7%		
	ALL_OTHER	328,584	2%				ALL_OTHER	94,323	1%		
CAPE	YARMOUTH	5,052	0%	1,976,040	12%	CAPE	YARMOUTH	0	0%	962,003	11%
	ORLEANS	160,862	1%				ORLEANS	0	0%		
	NAUSET	152,690	4%				NAUSET	0	7%		
	NANTUCKET	16,682	0%				NANTUCKET	16,682	0%		
	HARWICHPORT	71,951	0%				HARWICHPORT	60,805	1%		
	CHATHAM	1,125,406	7%				CHATHAM	469,386	5%		
	BARNSTABLE	216,096	1%				BARNSTABLE	213,125	2%		
	ALL_OTHER	227,301	1%				ALL_OTHER	202,005	2%		
CTCOAST	ALL_OTHER	170,943	1%	170,943	1%	CTCOAST	ALL_OTHER	71,851	1%	71,851	1%
DEL_MAR	ALL_OTHER	0	0%			DEL_MAR	ALL_OTHER	0	0%		
DOWNEAST	ALL_OTHER	0	0%			DOWNEAST	ALL_OTHER	0	0%		
GLOUCESTER	SALISBURY	36,902	0%	6,427,363	39%	GLOUCESTER	SALISBURY	12,217	0%	3,135,121	34%
	ROCKPORT	312,889	2%				ROCKPORT	185,255	2%		
	NEWBURYPORT	278,730	2%				NEWBURYPORT	256,140	3%		
	MARBLEHEAD	94,022	1%				MARBLEHEAD	0	0%		
	GLOUCESTER	5,672,638	34%				GLOUCESTER	2,681,510	29%		
	ALL_OTHER	32,182	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	178,658	1%	264,433	2%	LOWER_MID_ME	PORTLAND	165,533	2%	168,331	2%
	CHEBEAGUE_IS.	75,834	0%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	9,942	0%				ALL_OTHER	2,798	0%		

Table 348-Revenue Loss Impacts by Port and Region for Habitat Alternative 5d

ALTERNATIVE 5d											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	794,863	5%	794,863	5%	N_CAROLINA	ALL_OTHER	453,708	5%	453,708	5%
NEW_BEDFORD	NEW_BEDFORD	2,086,254	13%	2,179,889	13%	NEW_BEDFORD	NEW_BEDFORD	1,670,380	18%	1,670,831	18%
	FAIRHAVEN	60,771	0%				FAIRHAVEN	451	0%		
	ALL_OTHER	32,863	0%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	0	0%	14,875	0%	NEW_JERSEY	SHARK_RIVER	0	0%	14,126	0%
	PT_PLEASANT	749	0%				PT_PLEASANT	0	0%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	0	0%				LONG BEACH &BARNEGAT_L.	0	0%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	14,126	0%				CAPE_MAY	14,126	0%		
	BELMAR	0	0%				BELMAR	0	0%		
	BELFORD	0	0%				BELFORD	0	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_YORK	MONTAUK	148,422	1%	165,069	1%	NEW_YORK	MONTAUK	25,456	0%	40,896	0%
	HAMPTON_BAY	617	0%				HAMPTON_BAY	617	0%		
	GREENPORT	14,722	0%				GREENPORT	14,722	0%		
	FREEPORT	1,207	0%				FREEPORT	0	0%		
	ALL_OTHER	100	0%				ALL_OTHER	100	0%		
NHCOAST	SEABROOK	236,044	1%	1,455,614	9%	NHCOAST	SEABROOK	57,569	1%	185,408	2%
	RYE	500,899	3%				RYE	81,472	1%		
	PORTSMOUTH	575,879	3%				PORTSMOUTH	40,262	0%		
	NEWINGTON	0	0%				NEWINGTON	0	0%		
	NEW_CASTLE	13,375	0%				NEW_CASTLE	0	0%		
	HAMPTON	129,419	1%				HAMPTON	6,105	0%		

Table 348-Revenue Loss Impacts by Port and Region for Habitat Alternative 5d(cont.)

ALTERNATIVE 5d											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	58,843	0%	1,094,368	7%	RICOAST	NEWPORT	58,843	1%	803,596	9%
	ALL_OTHER	1,035,525	6%				ALL_OTHER	744,753	8%		
SOUTH_ME	ALL_OTHER	118,163	1%	118,163	1%	SOUTH_ME	ALL_OTHER	55,475	1%	55,475	1%
UPPER_MID_ME	S.W._HARBOR	373,586	2%	377,489	2%	UPPER_MID_ME	S.W._HARBOR	373,586	4%	374,141	4%
	ALL_OTHER	3,903	0%				ALL_OTHER	555	0%		
VIRGINIA	ALL_OTHER	146,069	1%	146,069	1%	VIRGINIA	ALL_OTHER	130,698	1%	130,698	1%
OTHER	ALL_OTHER	1,206	0%	1,206	0%	OTHER	ALL_OTHER	51	0%	51	0%
Grand Total		16,630,243		16,630,243	100%	Grand Total		9,100,245		9,100,245	100%

Table 348-Revenue Loss Impacts by Port and Region for Habitat Alternative 5d(cont.)

ALTERNATIVE 6											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	28,544	1%	109,737	3%	BOSTON	SCITUATE	0	0%	48,680	3%
	BOSTON	47,530	1%				BOSTON	47,530	3%		
	ALL_OTHER	33,663	1%				ALL_OTHER	1,151	0%		
CAPE	YARMOUTH	40,168	1%	677,117	17%	CAPE	YARMOUTH	0	0%	15,056	1%
	ORLEANS	278	0%				ORLEANS	0	0%		
	NAUSET	0	1%				NAUSET	0	3%		
	NANTUCKET	0	0%				NANTUCKET	0	0%		
	HARWICHPORT	110,857	3%				HARWICHPORT	0	0%		
	CHATHAM	138,263	3%				CHATHAM	0	0%		
	BARNSTABLE	376,841	10%				BARNSTABLE	6,353	0%		
	ALL_OTHER	10,709	0%				ALL_OTHER	8,704	1%		
CTCOAST	ALL_OTHER	12,718	0%	12,718	0%	CTCOAST	ALL_OTHER	12,718	1%	12,718	1%
DEL_MAR	ALL_OTHER	0	0%			DEL_MAR	ALL_OTHER	0	0%		
DOWNEAST	ALL_OTHER	0	0%			DOWNEAST	ALL_OTHER	0	0%		
GLOUCESTER	SALISBURY	6,408	0%	653,192	16%	GLOUCESTER	SALISBURY	0	0%	221,677	16%
	ROCKPORT	3,124	0%				ROCKPORT	0	0%		
	NEWBURYPORT	2,829	0%				NEWBURYPORT	0	0%		
	MARBLEHEAD	5,481	0%				MARBLEHEAD	0	0%		
	GLOUCESTER	633,178	16%				GLOUCESTER	221,677	16%		
	ALL_OTHER	2,172	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	289,076	7%	377,931	10%	LOWER_MID_ME	PORTLAND	279,073	20%	282,911	20%
	CHEBEAGUE_IS.	75,834	2%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	13,021	0%				ALL_OTHER	3,838	0%		

Table 349-Revenue Loss Impacts by Port and Region for Habitat Alternative 6

ALTERNATIVE 6											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	0	0%	0	0%	N_CAROLINA	ALL_OTHER	0	0%	0	0%
NEW_BEDFORD	NEW_BEDFORD	675,477	17%	1,136,343	29%	NEW_BEDFORD	NEW_BEDFORD	671,377	48%	671,377	48%
	FAIRHAVEN	439,576	11%				FAIRHAVEN	0	0%		
	ALL_OTHER	21,289	1%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	0	0%	0	0%	NEW_JERSEY	SHARK_RIVER	0	0%	0	0%
	PT_PLEASANT	0	0%				PT_PLEASANT	0	0%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	0	0%				LONG BEACH &BARNEGAT_L.	0	0%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	0	0%				CAPE_MAY	0	0%		
	BELMAR	0	0%				BELMAR	0	0%		
	BELFORD	0	0%				BELFORD	0	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_YORK	MONTAUK	31,147	1%	31,233	1%	NEW_YORK	MONTAUK	4,242	0%	4,328	0%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	86	0%				GREENPORT	86	0%		
	FREEPORT	0	0%				FREEPORT	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NHCOAST	SEABROOK	9,968	0%	753,638	19%	NHCOAST	SEABROOK	1,050	0%	51,129	4%
	RYE	25,113	1%				RYE	0	0%		
	PORTSMOUTH	326,458	8%				PORTSMOUTH	50,040	4%		
	NEWINGTON	388,615	10%				NEWINGTON	0	0%		
	NEW_CASTLE	335	0%				NEW_CASTLE	0	0%		
	HAMPTON	3,149	0%				HAMPTON	39	0%		

Table 349-Revenue Loss Impacts by Port and Region for Habitat Alternative 6(cont.)

ALTERNATIVE 6											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	57,983	1%	114,697	3%		ALL_OTHER	18,748	1%	15,636	1%
	ALL_OTHER	56,714	1%			RICOAST Total		34,384	2%		
SOUTH_ME	ALL_OTHER	30,264	1%	30,264	1%	SOUTH_ME	ALL_OTHER	3,006	0%	3,006	0%
UPPER_MID_ME	S.W._HARBOR	61,067	2%	63,031	2%	UPPER_MID_ME	S.W._HARBOR	61,067	4%	61,364	4%
	ALL_OTHER	1,964	0%				ALL_OTHER	297	0%		
VIRGINIA	ALL_OTHER	231	0%	231	0%	VIRGINIA	ALL_OTHER	0	0%	0	0%
OTHER	ALL_OTHER	0	0%	0	0%	OTHER	ALL_OTHER	0	0%	0	0%
Grand Total		3,960,131		3,960,131	100%	Grand Total		1,406,630		1,406,630	99%

Table 349-Revenue Loss Impacts by Port and Region for Habitat Alternative 6(cont.)

ALTERNATIVE 10A											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of TotalValue						Sum of TotalValue					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	40,765	1%	121,652	3%	BOSTON	SCITUATE	12,221	1%	60,902	5%
	BOSTON	47,530	1%				BOSTON	47,530	4%		
	ALL_OTHER	33,357	1%				ALL_OTHER	1,151	0%		
CAPE	YARMOUTH	62,109	1%	715,310	17%	CAPE	YARMOUTH	0	0%	16,105	1%
	ORLEANS	367	0%				ORLEANS	0	0%		
	NAUSET	0	0%				NAUSET	0	0%		
	NANTUCKET	0	0%				NANTUCKET	0	0%		
	HARWICHPORT	247,050	6%				HARWICHPORT	0	0%		
	CHATHAM	290,289	7%				CHATHAM	147	0%		
	BARNSTABLE	103,884	2%				BARNSTABLE	6,353	0%		
	ALL_OTHER	11,610	0%				ALL_OTHER	9,605	1%		
CTCOAST	ALL_OTHER	74,519	2%	74,519	2%	CTCOAST	ALL_OTHER	74,519	6%	74,519	6%
DEL_MAR	ALL_OTHER	0	0%			DEL_MAR	ALL_OTHER	0	0%		
DOWNEAST	ALL_OTHER	0	0%			DOWNEAST	ALL_OTHER	0	0%		
GLOUCESTER	SALISBURY	6,408	0%	696,853	17%	GLOUCESTER	SALISBURY	0	0%	221,195	16%
	ROCKPORT	26	0%				ROCKPORT	0	0%		
	NEWBURYPORT	2,829	0%				NEWBURYPORT	0	0%		
	MARBLEHEAD	5,481	0%				MARBLEHEAD	0	0%		
	GLOUCESTER	679,937	16%				GLOUCESTER	221,195	16%		
	ALL_OTHER	2,172	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	172,870	4%	269,137	6%	LOWER_MID_ME	PORTLAND	162,034	12%	169,638	13%
	CHEBEAGUE_IS.	75,834	2%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	20,433	0%				ALL_OTHER	7,604	1%		

Table 350 - Revenue Loss Impacts by Port and Region for Habitat Alternative 10A

ALTERNATIVE 10A													
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	0	0%	0	0%	N_CAROLINA	ALL_OTHER	0	0%	0	0%
NEW_BEDFORD	NEW_BEDFORD	648,342	16%	1,263,779	30%	NEW_BEDFORD	NEW_BEDFORD	644,242	48%	644,242	48%
	FAIRHAVEN	160,731	4%				FAIRHAVEN	0	0%		
	ALL_OTHER	454,705	11%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	0	0%	0	0%	NEW_JERSEY	SHARK_RIVER	0	0%	0	0%
	PT_PLEASANT	0	0%				PT_PLEASANT	0	0%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	0	0%				LONG BEACH &BARNEGAT_L.	0	0%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	0	0%				CAPE_MAY	0	0%		
	BELMAR	0	0%				BELMAR	0	0%		
	BELFORD	0	0%				BELFORD	0	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_YORK	MONTAUK	4,616	0%	4,717	0%	NEW_YORK	MONTAUK	0	0%	101	0%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	101	0%				GREENPORT	101	0%		
	FREEPORT	0	0%				FREEPORT	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NHCOAST	SEABROOK	9,968	0%	802,264	19%	NHCOAST	SEABROOK	1,050	0%	51,129	4%
	RYE	42,253	1%				RYE	0	0%		
	PORTSMOUTH	365,108	9%				PORTSMOUTH	50,040	4%		
	NEWINGTON	381,451	9%				NEWINGTON	0	0%		
	NEW_CASTLE	335	0%				NEW_CASTLE	0	0%		
	HAMPTON	3,149	0%				HAMPTON	39	0%		

Table 350 - Revenue Loss Impacts by Port and Region for Habitat Alternative 10A(cont.)

ALTERNATIVE 10A												
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	17,945	0%	102,503	2%	RICOAST	NEWPORT	17,945	1%	64,977	5%
	ALL_OTHER	84,559	2%				ALL_OTHER	47,033	3%		
SOUTH_ME	ALL_OTHER	23,352	1%	23,352	1%	SOUTH_ME	ALL_OTHER	6,162	0%	6,162	0%
UPPER_MID_ME	S.W._HARBOR	64,278	2%	88,682	2%	UPPER_MID_ME	S.W._HARBOR	61,067	5%	76,451	6%
	ALL_OTHER	24,403	1%				ALL_OTHER	15,384	1%		
VIRGINIA	ALL_OTHER	231	0%	231	0%	VIRGINIA	ALL_OTHER	0	0%	0	0%
OTHER	ALL_OTHER	0	0%	0	0%	OTHER	ALL_OTHER	0	0%	0	0%
Grand Total		4,162,998		4,162,998	100%	Grand Total		1,345,937		1,345,937	100%

Table 350 - Revenue Loss Impacts by Port and Region for Habitat Alternative 10A(cont.)

ALTERNATIVE 10B											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
Sum of Total Value						Sum of Total Value					
Region	Port	Total ($)				Region	Port	Total ($)			
BOSTON	SCITUATE	40,765	1%	121,652	3%	BOSTON	SCITUATE	12,221	1%	60,902	4%
	BOSTON	47,530	1%				BOSTON	47,530	3%		
	ALL_OTHER	33,357	1%				ALL_OTHER	1,151	0%		
CAPE	YARMOUTH	62,109	2%	639,263	17%	CAPE	YARMOUTH	0	0%	16,105	1%
	ORLEANS	367	0%				ORLEANS	0	0%		
	NAUSET	0	0%				NAUSET	0	0%		
	NANTUCKET	0	0%				NANTUCKET	0	0%		
	HARWICHPORT	247,050	7%				HARWICHPORT	0	0%		
	CHATHAM	290,289	8%				CHATHAM	147	0%		
	BARNSTABLE	27,838	1%				BARNSTABLE	6,353	0%		
	ALL_OTHER	11,610	0%				ALL_OTHER	9,605	1%		
CTCOAST	ALL_OTHER	74,519	2%	74,519	2%	CTCOAST	ALL_OTHER	74,519	5%	74,519	5%
DEL_MAR	ALL_OTHER	0	0%			DEL_MAR	ALL_OTHER	0	0%		
DOWNEAST	ALL_OTHER	0	0%			DOWNEAST	ALL_OTHER	0	0%		
GLOUCESTER	SALISBURY	6,408	0%	696,853	18%	GLOUCESTER	SALISBURY	0	0%	221,195	14%
	ROCKPORT	26	0%				ROCKPORT	0	0%		
	NEWBURYPORT	2,829	0%				NEWBURYPORT	0	0%		
	MARBLEHEAD	5,481	0%				MARBLEHEAD	0	0%		
	GLOUCESTER	679,937	18%				GLOUCESTER	221,195	14%		
	ALL_OTHER	2,172	0%				ALL_OTHER	0	0%		
LOWER_MID_ME	PORTLAND	248,691	7%	344,593	9%	LOWER_MID_ME	PORTLAND	237,854	15%	245,094	16%
	CHEBEAGUE_IS.	75,834	2%				CHEBEAGUE_IS.	0	0%		
	ALL_OTHER	20,068	1%				ALL_OTHER	7,240	0%		

Table 351 - Revenue Loss Impacts by Port and Region for Habitat Alternative 10B

ALTERNATIVE 10B												
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	Level 3			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
N_CAROLINA	ALL_OTHER	0	0%	0	0%	N_CAROLINA	ALL_OTHER	0	0%	0	0%
NEW_BEDFORD	NEW_BEDFORD	796,951	21%	1,251,656	33%	NEW_BEDFORD	NEW_BEDFORD	792,850	50%	792,850	50%
	FAIRHAVEN	0	0%				FAIRHAVEN	0	0%		
	ALL_OTHER	454,705	12%				ALL_OTHER	0	0%		
NEW_JERSEY	SHARK_RIVER	0	0%	0	0%	NEW_JERSEY	SHARK_RIVER	0	0%	0	0%
	PT_PLEASANT	0	0%				PT_PLEASANT	0	0%		
	NEPTUNE	0	0%				NEPTUNE	0	0%		
	MONMOUTH	0	0%				MONMOUTH	0	0%		
	LONG BEACH &BARNEGAT_L.	0	0%				LONG BEACH &BARNEGAT_L.	0	0%		
	HIGHLANDS	0	0%				HIGHLANDS	0	0%		
	CAPE_MAY	0	0%				CAPE_MAY	0	0%		
	BELMAR	0	0%				BELMAR	0	0%		
	BELFORD	0	0%				BELFORD	0	0%		
	ATLANTIC_CITY	0	0%				ATLANTIC_CITY	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NEW_YORK	MONTAUK	4,616	0%	4,717	0%	NEW_YORK	MONTAUK	0	0%	101	0%
	HAMPTON_BAY	0	0%				HAMPTON_BAY	0	0%		
	GREENPORT	101	0%				GREENPORT	101	0%		
	FREEPORT	0	0%				FREEPORT	0	0%		
	ALL_OTHER	0	0%				ALL_OTHER	0	0%		
NHCOAST	SEABROOK	9,968	0%	420,813	11%	NHCOAST	SEABROOK	1,050	0%	11,646	1%
	RYE	42,253	1%				RYE	0	0%		
	PORTSMOUTH	365,108	10%				PORTSMOUTH	10,558	1%		
	NEWINGTO N	0	0%				NEWINGTON	0	0%		
	NEW_CASTLE	335	0%				NEW_CASTLE	0	0%		
	HAMPTON	3,149	0%				HAMPTON	39	0%		

Table 351 - Revenue Loss Impacts by Port and Region for Habitat Alternative 10B(cont.)

ALTERNATIVE 10B											
Level 1			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)	**Level 3**			Between Port Impact (%)	Total Revenue Impact ($)	Between Region Impact (%)
RICOAST	NEWPORT	17,945	0%	102,503	3%	RICOAST	NEWPORT	17,945	1%	64,977	4%
	ALL_OTHER	84,559	2%				ALL_OTHER	47,033	3%		
SOUTH_ME	ALL_OTHER	23,352	1%	23,352	1%	SOUTH_ME	ALL_OTHER	6,162	0%	6,162	0%
UPPER_MID_ME	S.W._HARBOR	64,278	2%	88,682	2%	UPPER_MID_ME	S.W._HARBOR	61,067	4%	76,451	5%
	ALL_OTHER	24,403	1%				ALL_OTHER	15,384	1%		
VIRGINIA	ALL_OTHER	231	0%	231	0%	VIRGINIA	ALL_OTHER	0	0%	0	0%
OTHER	ALL_OTHER	0	0%	0	0%	OTHER	ALL_OTHER	0	0%	0	0%
Grand Total		3,768,834		3,768,834	100%	Grand Total		1,570,002		1,570,002	100%

Table 351 - Revenue Loss Impacts by Port and Region for Habitat Alternative 10B(cont.)

Surf Clam and Ocean Quahog Fishery**:**

The potential impacts on the surf clam/ocean quahog fishery were evaluated separately using methods similar to that which was used for other fisheries. However, because landings in the clam VTR's are reported in bushels rather than pounds, an average price from dealer records (reported in terms of $ per pound meat weight) could not be assigned. For this reason impacts are reported in physical rather than dollar units and are aggregated at the state level.

Alternatives 3a, 3b and 4 would have no impact on the surf clam/ocean quahog fishery. Alternative 6 would mitigate impacts for the most states but would have the largest overall impact and would affect the state of Massachusetts exclusively. Of the Alternatives that would affect the fishery, Alternative 5a would have aggregate impacts similar to that of Alternatives 5b and 5d but would these impacts would be more broadly distributed across states in the Northeast region.

In terms of how surf clam/ocean quahog impacts may be distributed across states, the Massachusetts share of impacts is higher than any other state with the exception of New Jersey under Alternative 5a. Specifically, Massachusetts represents 100% of landings losses for Alternative 6; 87% under Alternative 5b; 51.2% under Alternative 5d and 45.4% under Alternative 5c (Table 352). Distributive impacts under Alternative 5a were estimated to be greatest for New Jersey (56.3%) followed by Massachusetts (23.4%), Maryland (19.4%) and Rhodes Island (0.9%). Distributive impacts under Alternative 5b were estimated to be greatest for Massachusetts (87.1%) followed by New Jersey (11.7%) and Rhode Island (1.3%). Distributive impacts under Alternative 5c were estimated to be greatest for Massachusetts (45.4%) followed by New Jersey (40.1%), Maryland (13.8%), and Rhode Island (0.7%). Distributive impacts under Alternative 5d were estimated to be greatest for Massachusetts (51.2%) and Rhode Island (48.8%).

State	Alternative 3a, 3b, & 4	Alternative 5a	Alternative 5b	Alternative 5c	Alternative 5d	Alternative 6	Alternative 10A & 10B
MA	0	23.4%	87.1%	45.4%	51.2%	100.0%	92.5%
MD	0	19.4%	0.0%	13.8%	0.0%	0.0%	0.0%
ME	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NJ	0	56.3%	11.7%	40.1%	0.0%	0.0%	0.0%
RI	0	0.9%	1.3%	0.7%	48.8%	0.0%	7.5%

Table 352 - Share of Total Surf Clam/Ocean Quahog Landings Loss (in bushels) by State and EFH Alternative

For the surf clam/ocean quahog fishery, aggregate landings from retained VTR records were 5.6 million bushels for calendar year 2001. Based on locations provided in these data no trips were reported as having occurred inside the confines of any of the specified habitat closure for Alternatives 3a, 3b, or 4. Therefore, the habitat closures for these three alternatives would have no impact on the surf clam/ocean quahog fishery. The remaining alternatives would affect between 2 and 7% of total fishery landings (Table 299).

State	Total Bushels	Alternative 3a, 3b, & 4	Alternative 5a	Alternative 5b	Alternative 5c	Alternative 5d	Alternative 6	Alternative 10A & 10B
MA	936,236	0	4.1%	11.0%	11.0%	8.8%	40.7%	4.8%
MD	622,065	0	5.1%	0.0%	5.1%	0.0%	0.0%	0.0%
ME	108,590	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NJ	3,788,123	0	2.4%	0.4%	2.4%	0.0%	0.0%	0.0%
RI	175,920	0	0.9%	0.9%	0.9%	44.6%	0.0%	2.1%
Totals	5,630,934	0	2.9%	2.1%	4.0%	2.9%	6.8%	0.9%

Table 353 - Proportional Loss of Surf Clam/Ocean Quahog Landings (bushels) by State and Alternative

5.6.2.2.5.3 General Revenue Loss Impacts

Alternative 5b level 1 will result in the most significant revenue losses nearing 38 million dollars. The revenue impact for Alternatives 6, 10A, and 10B are approximately 4 million dollars; significantly less than all other alternatives. Any one of these three alternatives would be 33 million less than the losses that may be experienced under alternative 5b, the most restrictive.

Vessel length class

Alternative 5b has the greatest over-all impact across all vessel sectors for level 1 EFH closures ranging from income impacts of 10% for large and medium vessels to 23% for small vessels. Level 3 impacts remain the same for large vessels and fall below 10% for medium and small vessels. Alternative 6, 10A, and 10B have the least impact on revenue across all vessel categories, all of which are less than 3%. Revenue impacts for small and medium vessels are most affected by alternatives 5a - 5d while large vessels are more affected by alternatives 3a and 3b. Level 3 revenue impacts are generally lessened for medium and small vessels while large vessel impacts remain constant.

Length Class	Alternatives - Level 1									
	3a	3b	4	5a	5b	5c	5d	6	10A	10B
LARGE	**11%**	**11%**	7%	3%	**10%**	4%	2%	1%	1%	1%
MEDIUM	4%	4%	3%	**10%**	**10%**	**11%**	8%	1%	2%	2%
SMALL	7%	5%	4%	**13%**	**23%**	**18%**	**12%**	2%	2%	2%
Length Class	**Alternatives - Level 3**									
	3a	**3b**	**4**	**5a**	**5b**	**5c**	**5d**	**6**	**10A**	**10B**
LARGE	**11%**	**11%**	7%	3%	**10%**	4%	2%	1%	1%	1%
MEDIUM	3%	3%	3%	8%	8%	9%	7%	1%	1%	1%
SMALL	1%	0%	0%	3%	6%	5%	4%	0%	0%	0%

Table 354- Revenue Impacts Within Vessel Length Class by Alternative and EFH Level

Number of affected vessels

The number of small vessels impacted is substantially less for a level 3 closure while the number of vessels impacted for large and medium vessel classes is not significantly different between level 1 and 3 closure alternatives. The number of boats affected and the average revenue loss of impacted vessels is greater for alternatives 5a, 5b, 5c, and 5d as compared to other alternatives.

Length Class	Alternatives – Level 1									
	3a	3b	4	5a	5b	5c	5d	6	10A	10B
LARGE (403 total)										
Impacted Vessels	129	128	117	119	177	123	106	40	35	33
Average Revenue Loss for Impacted Vessels	30%	30%	25%	18%	21%	20%	17%	13%	8%	9%
MEDIUM (330 total)										
Impacted Vessels	55	50	45	133	122	133	115	38	39	37
Average Revenue Loss for Impacted Vessels	22%	21%	20%	35%	30%	35%	33%	16%	17%	18%
SMALL (1,428 total)										
Impacted Vessels	323	283	239	451	532	512	438	197	213	211
Average Revenue Loss for Impacted Vessels	29%	28%	27%	33%	51%	46%	38%	20%	22%	22%
Length Class	**Alternatives – Level 3**									
LARGE (403 total)										
Impacted Vessels	124	123	112	112	174	114	103	33	30	32
Average Revenue Loss for Impacted Vessels	29%	29%	24%	15%	21%	16%	16%	9%	7%	9%
MEDIUM (330 total)										
Impacted Vessels	43	39	33	106	103	112	96	26	24	23
Average Revenue Loss for Impacted Vessels	20%	17%	15%	31%	30%	32%	33%	12%	12%	12%
SMALL (1,428 total)										
Impacted Vessels	57	40	28	98	120	118	101	29	32	30
Average Revenue Loss for Impacted Vessels	11%	7%	5%	28%	51%	41%	32%	5%	5%	5%

Table 355- Summary of Number of Impacted Vessels and Average Revenue Loss per Vessel

Gear

The hook, gillnet and trap gear sectors are consistently impacted across all alternatives for level one closures. These impacts are eliminated for level 3 closures. Scallop dredge and trawl gear sectors impacts remain the same for level 1 and level 3 closures.

Gear Type	Alternatives - Level 1									
	3a	3b	4	5a	5b	5c	5d	6	10A	10B
GILLNET	8%	7%	4%	**19%**	**25%**	**17%**	**17%**	2%	4%	4%
HOOK	**25%**	**24%**	**22%**	**10%**	**28%**	**10%**	**14%**	5%	9%	9%
SCALLOP TRAWL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SCALLOP DREDGE	7%	7%	4%	1%	**12%**	2%	1%	0%	0%	0%
TRAPS	2%	2%	2%	6%	**11%**	**14%**	4%	4%	2%	1%
TRAWL	**12%**	**12%**	**10%**	**11%**	**14%**	**14%**	9%	1%	1%	1%
Gear Type	**Alternatives - Level 3**									
GILLNET	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
HOOK	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SCALLOP TRAWL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SCALLOP DREDGE	7%	7%	4%	1%	**12%**	2%	1%	0%	0%	0%
TRAPS	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TRAWL	**12%**	**12%**	10%	**11%**	**14%**	**14%**	9%	1%	1%	0%

Table 356- Percent Total Impact Within Gear Type by Alternative and EFH Level

5.6.2.2.5.4 Analysis by Alternative

Alternative 1 - No Action (Not selected) and Alternative 2 (Proposed Action)
Neither of these alternatives includes habitat specific measures beyond what is included for management measures already under consideration. Therefore, there will be no additional social and economic impacts beyond what has already been evaluated for Amendment 10 or will be evaluated for the SEIS for Amendment 13.

Alternative 3a - Area Closure (Not selected
The gross loss of revenue for a level 1 EFH closure is $23,237,630. The community of New Bedford, MA will experience the greatest percentage of this loss at 63% ($15,408,480) followed by Gloucester (13%), MA. Ten percent of the loss will affect the Cape Cod region and is largely distributed between the communities of Harwichport and Chatham, MA (Table 342). Revenue losses will be 22 % ($5,138,747) lower for a level 3 EFH closure (Table 296). The disproportionate loss found in the level 1 closure for New Bedford, MA will rise to 83% (Table 342).

Vessel – The revenue for the large vessel sector will be impacted by eleven percent for both level 1 and 3 EFH closures. Five percent to 7% of revenue for medium and small vessels will be impacted for level 1 closure with the range reduced to 1% to 3% for a Level 3 EFH closure (Table 354). The average revenue losses for level 1 closures will range from 30% for large vessels to 22% for medium vessels. Revenue for one-third of all large vessels will be affected. Level 3 closures will result in fewer affected small vessels (Table 355).

Gear – Revenue for hook (25%) and trawl (12%) gear sectors will be the most affected for level 1 EFH closures followed by gillnet (8%) and scallop dredge (7%). Under a level 3 closure, revenue loss impacts are eliminated for gillnet, hook, and trap sectors while impacts remain the same for scallop dredge and trawl sectors (Table 356).

Alternative 3b - Area Closure (Not selected)
The gross loss of revenue for a level 1 EFH closure is $22,047,497. The community of New Bedford, MA will experience the greatest percentage of this loss at 70% ($14,676,812). Eleven percent of the loss will affect the Cape Cod region and is largely distributed between the communities of Harwichport and Chatham, MA (Table 343). Revenue losses will be 21 % ($4,544,127) lower for a level 3 EFH closure (Table 3). The disproportionate loss found in the level 1 closure for New Bedford, MA will rise to 86% for a level 3 closure (Table 343).

Vessel – The revenue for the large vessel sector will be impacted by eleven percent for both level 1 and 3 EFH closures. The impact on revenue for medium and small vessels, 4% to 5% for a level 1 closure, is reduced for medium vessels and eliminated for small vessels for a level 3 EFH closure (Table 354).
The average revenue losses for impacted vessels for level 1 closures will range from 30% for large vessels to 21% for medium vessels. Revenue for one-third of all large vessels will be affected. Level 3 closures will result in fewer affected small vessels and smaller revenue losses (Table 355).

Gear – Revenue for hook (24%) and trawl (12%) gear sectors will be the most affected for level 1 EFH closures followed by gillnet (7%) and scallop dredge (7%). Under a level 3 closure, revenue loss impacts are eliminated for gillnet, hook, and trap sectors while impacts remain the same for scallop dredge and trawl sectors (Table 356).

Alternative 4 - Area Closure (Not selected)
The gross loss of revenue for a level 1 EFH closure is $15,599,271. The community of New Bedford, MA will experience the greatest percentage of this loss at 63% ($9,803,675). Fourteen percent of the loss will affect the Cape Cod region and is largely distributed between the communities of Harwichport and Chatham, MA (Table 344). Revenue losses will be 23 % ($3,629,039) lower for a level 3 EFH closure

(Table 3). The disproportionate loss found in the level 1 closure for New Bedford, MA will rise to 83% for a level 3 closure (Table 344).

Vessel –The large vessel sector will be impacted by 7% and 3% for medium vessels for both level 1 and level 3 EFH closures. Small vessel revenue impacts, 4% for level 1, are alleviated for a level 3 closure (Table 354). Average revenue losses for affected vessels for level 1 closures will range from 20% to 27%. The number of affected small vessels is substantially reduced for a level 3 closure (Table 355).

Gear – Revenue for hook (22%) and trawl (10%) gear sectors will be the most affected for level 1 EFH closures followed by gillnet (4%) and scallop dredge (4%). Under a level 3 closure, revenue loss impacts are eliminated for gillnet, hook, and trap sectors while impacts remain the same for scallop dredge and trawl sectors (Table 356).

Alternative 5a - Area Closure (Not selected)
The gross loss of revenue for a level 1 EFH closure is $19,768,983. Seventy-seven percent of the loss is distributed across five regions in descending order of impact - New Bedford (23%), Gloucester (21%), New Jersey (12%), Cape Cod (11%), and Boston (10%). Communities within these regions most impacted by this alternative are New Bedford, MA (21%), Gloucester, MA (18%), Boston (7%), Chatham, MA (6%), and Belford, NJ (6%) (Table 345). Revenue losses will be 43 % ($ 8,520,746) lower for a level 3 EFH closure (Table 296). The proportionately distributed loss found in the level 1 closure remains for a level closure 3 however increases to 27% for New Bedford and 16% for Boston, MA (Table 345) .

In relation to the surf clam/ocean quahog fishery, alternative 5a would affect 2.9% of total landings but would affect 5.1% of total Maryland landings; 4.1% of Massachusetts landings; 2.4% of New Jersey Landings; and 0.9% of Rhode Island landings. None of the habitat alternatives would affect surf clam/ocean quahog landings in Maine (Table 352).

Vessel – Revenue of small vessels (13%) and medium vessels (10%) will be affected by a level 1 closure. The impact for small vessels is reduced to 3% for a level 3 closure (Table 354). Approximately one-third of the affected medium and small vessels will experience a 35% to 33% average loss in revenue. While average losses are slightly less for all vessel classes for a level 3 closure, the number of affected small vessels is less than one-fourth of the total affected for a level 1 closure (Table 355).

Gear – Revenue for gillnet (19%), trawl (11%), and hook (10%) gear sectors will be the most affected for level 1 EFH closures followed by traps (6%). Under a level 3 closure, revenue loss impacts are eliminated for gillnet, hook, and trap sectors while impacts remain the same for scallop dredge and trawl sectors (Table 356).

Alternative 5b - Area Closure (Not selected)
The gross loss of revenue for a level 1 EFH closure is $37,829,644. Seventy-six percent of the loss is distributed across three regions in descending order of impact - New Bedford (37%), Gloucester (23%), and Cape Cod (16%). Communities within these regions most impacted by this alternative are New Bedford, MA (34%), Gloucester, MA (17%), and Chatham, MA (10%) (Table 346). Revenue losses will be 37 % ($ 13,923,311) lower for a level 3 EFH closure (Table 296). The distribution of loss found in the level 1 closure remains for a level closure however increases disproportionately to 51% for New Bedford, MA (Table 346).

In relation to the surf clam/ocean quahog fishery, alternative 5b would affect 2.1% of total landings. Across states, Alternative 5b would affect 11.0% of Massachusetts landings and 0.4% and 0.9% of landings in New Jersey and Rhode Island respectively. Alternative 5b would have no impact on either Maine or Maryland landings (Table 352) .

Vessel – All vessel size sectors will be impacted by a 10% or greater loss of revenue for a level 1 EFH closure with small length vessels (23%) experiencing the greatest impact as compared to other alternatives. The percentage loss of revenue remains constant at 10% for large vessels under both EFH closure levels. Impacts fall below 10% for small and medium length class vessels for level 3 closures (Table 354). Approximately one-third of the affected small and medium vessels will experience an average revenue loss of 35% and 51% respectively. While average losses are the same for all vessel classes for a level 3 closure, the number of affected small vessels is one-fourth of the total affected for a level 1 closure (Table 355).

Gear – Revenue impacts for hook (28%) and gillnet (25%) gear sectors will be most impacted followed by trawl (14%), scallop dredge (12%), and traps (11%) sectors will for level 1 EFH closures. Under a level 3 closure, revenue loss impacts are eliminated for gillnet, hook, and trap sectors while impacts remain the same for scallop dredge and trawl sectors (Table 356).

Alternative 5c - Area Closure (Not selected)
The gross loss of revenue for a level 1 EFH closure is $24,762,205. Eighty-one percent of the loss is distributed across four regions in descending order of impact - Gloucester (37%), New Bedford (20%), Boston (14%)and New Jersey (10%). Communities within these regions most impacted by this alternative are Gloucester, MA (28%), New Bedford, MA (17%), Boston (6%), Scituate (5%), and Chatham (5%) (Table 347). Revenue losses will be 46% ($ 11,509,291) lower for a level 3 EFH closure (Table 347). The relative distribution of loss found in the level 1 closure remains similar for a level 3 closure (Table 296).

In relation to the surf clam/ocean quahog fishery, alternative 5c would affect 4.0% of total landings. Across states, Alternative 5b would affect 11.0% of Massachusetts landings; 5.1 % of Maryland landings; and 2.4% and 0.9% of landings in New Jersey and Rhode Island respectively. Alternative 5b would have no impact on Maine landings (Table 352).

Vessel - Revenue losses for small (18%) and medium (11%) vessel sectors will be the most impacted for a level one EFH closure. All impacts fall below 10% for level 3 closures (Table 354). Approximately one-third of the affected small and medium vessels will experience an average revenue loss of 35% and 46% respectively. While average losses are slightly less for all vessel classes for a level 3 closure, the number of affected small vessels is one-fourth of the total affected for a level 1 closure (Table 355).

Gear – Revenue impacts for gillnet (17%), traps (14%), trawl (14%), and hook (10%) gear sectors will be most impacted for level 1 EFH closures. Under a level 3 closure, revenue loss impacts are eliminated for gillnet, hook, and trap sectors while impacts remain the same for scallop dredge and trawl sectors (Table 356).

Alternative 5d - Area Closure (Not selected)
The gross loss of revenue for a level 1 EFH closure is $16,630,724. Sixty-four percent of the loss is distributed across three regions in descending order of impact - Gloucester (39%), New Bedford (13%), and Cape Cod (12%). Communities within these regions most impacted by this alternative are Gloucester, MA (34%), New Bedford, MA (13%), and Chatham, MA (7%). The remaining 36% percent is distributed across ten regions (Table 348). Revenue losses will be 45% ($ 7,529,998) lower for a level 3 EFH closure (Table 296). The relative distribution of loss found in the level 1 closure is similarly distributed across four regions (Table 348).

In relation to the surf clam/ocean quahog fishery, alternative 5d would affect 2.9% of total landings. Across states only Massachusetts and Rhode Island would be affected with reductions of 8.8% and 44.6% respectively (Table 352).

Vessel – The small vessel length sector will have the greatest loss of income (12%) for a level 1 EFH closure. The impact on all vessel length sectors is less than 10% for a Level 3 EFH closure (Table 354). Approximately one-third of the affected small and medium vessels will experience an average revenue loss of 38% and 33% respectively. While average losses are slightly less for large and small vessel classes for a level 3 closure, the number of affected small vessels is one-fourth of the total affected for a level 1 closure (Table 355).

Gear – Revenue impacts for gillnet (17%) and hook (10%) gear sectors will be most impacted for level 1 EFH closures followed by trawl gear (9%) and traps (4%). Under a level 3 closure, revenue loss impacts are eliminated for gillnet, hook, and trap sectors while impacts remain the same for scallop dredge and trawl sectors (Table 356).

Alternative 6 - Area Closure (Not selected)
The gross loss of revenue for a level 1 EFH closure is $3,960,131. Ninety-one percent of the loss is distributed across five regions in descending order of impact - New Bedford (29%), New Hampshire Coast (19%), Cape Cod (17%), Gloucester (16%), and Lower Mid-Coast Maine (10). Communities within these regions most impacted by this alternative are New Bedford/Fairhaven, MA (17%), Gloucester, MA (16%), Portsmouth, NH (8%), Newington, NH (10%), and Barnstable, MA (10%) (Table 356). Revenue losses will be 64 % ($ 2,553,501) lower for a level 3 EFH closure (Table 296). The proportionately distributed loss found in the level 1 closure remains for a level 3 closure (Table 356).

In relation to the surf clam/ocean quahog fishery, alternative 6 would have the largest impact (6.8%) on surf clam/ocean quahog landings. Further, Alternative 6 would mitigate all potential impacts on states other than Massachusetts but would impact 40.7% of State landings (Table 352).

Vessel – This alternative represents the least impact to revenue across all vessel classes for both EFH levels. The greatest impact on revenue, across all size sectors, will be for small vessels (2%) for a level 1 closure which is eliminated under a level 3 closure (Table 354). Average revenue losses range from 13% for large vessels to 20% for small vessels. The number of affected vessels is substantially less than for all other alternatives. While average losses are less for large and small vessel classes for a level 3 closure, the number of affected small vessels is one-sixth of the total affected for a level 1 closure (Table 355).

Gear – Revenue impacts for this alternative are the least affected compared to the other alternatives. Hook (5%) and traps (4%) will be most impacted for level 1 EFH closures. Under a level 3 closure, revenue loss impacts for trawl gear (1%) remain the same and eliminated for all other gear sectors (Table 356).

Alternative 7 – Gear (Proposed action)
Data used to evaluate this habitat alternative has been determined inadequate for this purpose. Alternative data configurations and years will need to be evaluated to improve the reliability of this analysis.

Alternative 8 – Gear (Not selected)
This alternative offers five levels of restrictiveness ranging from the least restrictive (8a) to the most restrictive (8e). Level 8a freezes the maximum size of rockhopper and roller trawl gear at the maximum size currently in use. For New England, this size range ranges approximately from 31” to 36”. This level would not impact vessels currently working with this gear specification. However, it would prevent vessels currently operating with this configuration from increasing roller gear size to enable future fishing in areas with greater bottom relief. Level 8e gradually restricts the size of otter trawl ground gear over a multi-year year period from, for example, maximum allowable size of 24” in the first year to a maximum allowable size of 5” in the last year. This is an example scenario for which gear size and incremental gear reductions as well as the length of time at each interval may vary from this profile. This alternative allows more time for vessels to plan for and acquire required gear. Multiple changes in gear configurations increase the cost of adapting to increasingly restrictive management measures exponentially each time gear modification are made while increasingly restricting the fishing area to bottoms with incrementally less relief.

Alternative 9 – Gear (Not selected)
If this alternative is done specific to monitor habitat measures, then VMS acquisition costs can be attributed to these measures. However, if this gear requirement is adopted under Amendment 13, then costs would be allocated to that management measure. In addition to purchase and maintenance costs born by vessel owners, agency program monitoring costs are also an important consideration. Purchase and maintenance costs are estimated below.

To cover the entire fishing fleet (Table 358) of 1484 vessels, at $2900 per unit including the PC, would cost $4.3 million initially, or less than 1% of the ex-vessel value of New England fisheries ($681 million in 2000). Although fishing effort is reduced to half the 73,063 DAS allocated, it is expected that the vessels will place those days-at sea (one-for-one) in other fisheries, in order to stay in business. With 73,063 days-at-sea (with the VMS shut off while the vessel is tied to the dock) adds $73 thousand per year. Double-pinging to protect closed areas or participate in exempted fisheries add $70 thousand annually. Safety may be enhanced by including distress buttons on each unit, and costs $1.6 million for the 1484 boats and vessels, but this is not a requirement for groundfish management.

However, the benefits of total fleet coverage, especially to a multispecies fishery like that managed by the groundfish FMP, are much greater than tallying the official DAS and protecting the large, fixed closed areas. If all vessels require VMS, even partial closed areas become somewhat more inviolate because the enforcement agencies can identify every boat that enters them at any time. Likewise, corroboration of other reporting will be comprehensive rather than piecemeal, as it is with less than full VMS coverage. Safety at sea coverage will be comprehensive, and the extra $1100 per unit for this purpose adds only $1.6 million, to protect nearly 1500 U.S. vessels at sea. Any requirements for sampling at sea will be greatly enhanced with full VMS coverage, because the density of fishing vessel activity in the various fish stock areas will be known. Observer and Homeland Security programs will be enhanced, in similar fashion. Finally, trip limits, gear restrictions, fish sizes and other management measures may be affected.

Optionally, to cover that portion of the fishing fleet (Table 358) that has over 10 DAS allocated will eliminate VMS costs on vessels minimally involved in the multi-species fishery. These 1083 vessels, at $2900 per unit including the PC, would cost $3.1 million initially. Their 72,473 days-at-sea (with the VMS shut off while the vessel is tied to the dock) add $72 thousand per year. Double-pinging to protect closed areas or participate in exempted fisheries add $69 thousand annually. Additionally, safety would be enhanced by including distress buttons on each unit, and costs $1.1 million for the 1083 boats and vessels.

Finally, to cover that portion of the fishing fleet (Table 358) that has over 20 DAS allocated will eliminate VMS costs on even more vessels involved in the multi-species fishery. These 988 vessels, at $2900 per unit including the PC, would cost $2.8 million initially. Their 71,074 days-at-sea (with the VMS shut off while the vessel is tied to the dock) add $71 thousand per year. Double-pinging to protect closed areas or participate in exempted fisheries add $68 thousand annually. Additionally, safety could be enhanced with distress buttons on each unit, and costs $1.1 million for the 988 boats and vessels.

The benefits of such programs are reduced, somewhat, from those attainable with total VMS coverage, particularly the enforcement effectiveness on secondary measures like partial closures and trip limits. The costs are reduced fleet-wide, but are the same for each vessel in the program. The downside for vessels in the program is that, although they pay the same cost, the effectiveness and thus the benefits of management are reduced proportionate to the percent of the fleet with mandatory VMS. The incentive, however, is that mandatory-VMS vessels may participate in exempted fisheries in the closed areas.

Device	Boatracs	Thrane & Thrane 3022D	Thrane & Thrane 3026M	Comments:
Cost	$6,000	$2,650	$*1,550*	Inmarsat has *no* service connection fee
Communication (flat fee; add'l amount above some limit)	$3/day two-way	$1/day two-way (requires PC)	$1/day two-way (requires PC)	e.g. Thrane & Thrane sells a terminal for $1,350
Distress buttons	Yes	Yes	No	
Delay	5-10 minutes	5-10 minutes	5-10 minutes	No transmit, no cost with Inmarsat
Maintenance	Replacement parts available	2 year warranty	2 year warranty	

Table 357 - Comparison of VMS Vendors

Note: Trimble is dropped from consideration; they no longer provide Inmarsat based units. Likewise, Argos is dropped because it is only approved for use in Alaska.

Boats	Initial Cost ($1550 plus $1350 PC per boat)	Communication Cost ($1 per DAS)	Pinging Cost* (24/DAS)	Safety ($1,100 per boat)
1484 Vessels	$4,303,600	$73,063	$70,140	$1,632,400

Table 358 - Cost of VMS

Note: currently, NE OLE pays all costs associated with the advisory email messaging and extra positioning costs when a vessel enters a closed area; monthly charges average $1,500.

Boatracs cost 7 cents per ping, or $1.68 per DAS for 24 pings; Inmarsat, 4 cents, or $0.96. Pinging costs are shown using Inmarsat.

Alternative 10A – Area Closure (Not selected)

The gross loss of revenue for a level 1 EFH closure is $4,162,998. Eighty-three percent of the loss is distributed across four regions in descending order of impact - New Bedford (30%), New Hampshire Coast (19%), Cape Cod (17%), and Gloucester (17%). Communities within these regions most impacted by this alternative are New Bedford/Fairhaven, MA (20%), Gloucester, MA (17%), Portsmouth, NH (9%), Newington, NH (9%), Chatham, MA (7%), and Harwichport, MA (6%) (Table 356). Revenue losses will be 67 % ($ 2,817,060) lower for a level 3 EFH closure (Table 296). The proportionately distributed loss found in the level 1 closure remains for New Bedford and Gloucester regions for a level 3 closure (Table 356) with the loss nearly mitigated for the Cape Cod and New Hampshire coast. However, the proportionate loss increases for Lower Mid-Coast Maine region (Table 212).

In relation to the surf clam/ocean quahog fishery, alternative 10A would have less than 1% impact on surf clam/ocean quahog landings. Alternative A would mitigate all potential impacts on states other than Massachusetts and Rhode Island. However, in both cases the impact on state landings would be relatively small (4.8% in Massachusetts and 2.1% in Rhode Island) (Table 352).

Vessel – This alternative represents nearly equivalent revenue losses to that of Alternative 6 for both EFH levels. The impact on revenue, across all size sectors, will be the same for both small and medium vessels

(2%) and would have least impact on large vessels for a level 1 closure. The level 3 closure would eliminate impacts on small vessels and would have equal impact on medium and large vessels (1%) (Table 354). Average revenue losses range from 8% for large vessels to 22% for small vessels. The number of affected vessels is less than for all other alternatives. While average losses are less for large and small vessel classes for a level 3 closure, the number of affected small vessels is less than one-sixth of the total affected for a level 1 closure (Table 355).

Gear – Revenue impacts for this alternative are the least affected for trap and trawl gear compared to the other alternatives. Hook (9%) gear impacts are similar to that of Alternative 5a while gillnet gear impacts are similar to impacts under Alternative 4. Under a level 3 closure, revenue loss impacts for trawl gear (1%) remain the same but are eliminated for all other gear sectors (Table 356).

Alternative 10B – Area Closure (Proposed action)
The impacts of Alternative 10B are similar to that of 10A although gross revenue impacts are lower ($3,768,834). Eighty-eight percent of the loss is distributed across five regions in descending order of impact - New Bedford (33%), Gloucester (18%), Cape Cod (17%), New Hampshire Coast (11%), and Lower Mid-Coast Maine (9%). Communities within these regions most impacted by this alternative are New Bedford/Fairhaven, MA (21%), Gloucester, MA (18%), Portsmouth, NH (10%), Chatham, MA (8%), and both Harwichport, MA and Portland, ME (7%) (Table 356). Revenue losses will be 58 % ($ 2,198,832) lower for a level 3 EFH closure (Table 296). Note that these losses are distributed across regions in roughly the same order of impact but that the proportional impact in New Bedford increases to 50% of total revenue losses. (Table 356).

In relation to the surf clam/ocean quahog fishery, alternative 10B would have the same impact as that of Alternative 10A (Table 352).

Vessel – This alternative represents nearly equivalent revenue losses to that of Alternative 6 and Alternative 10A for both EFH levels. The impact on revenue, across all size sectors, will be the same for both small and medium vessels (2%) and would have least impact on large vessels for a level 1 closure. The level 3 closure would eliminate impacts on small vessels and would have equal impact on medium and large vessels (1%) (Table 354). Average revenue losses range from 9% for large vessels to 22% for small vessels. The number of affected vessels is less than for all other alternatives. Average losses are less for small vessel classes for a level 3 closure (Table 355).

Gear – Revenue impacts for this alternative are the least affected for trap and trawl gear compared to the other alternatives. Hook (9%) gear impacts are similar to that of Alternative 5a while gillnet gear impacts are similar to impacts under Alternative 4. Under a level 3 closure, revenue loss impacts are eliminated for all gear sectors (Table 356).

5.6.2.2.5.5 Summary of Social and Community Impacts of Habitat Alternatives

In general, impacts across all forms of analyses identified habitat alternative 5b as having the greatest impact and alternatives 6, 10a, and 10b as having the least. In between these extremes, more severe impacts (gross sales impacts of about $100 million; income losses of about $30 million; and employment losses of up to 1,400 jobs) will result from alternatives 3a, 3b, and 5c. Less severe impacts (losses of about $70 million in sales, $20 million in income losses, and losses of less than 1,000 jobs) will result from alternatives 4, 5a, and 5d.

In relation to area closure habitat measures considered here, the state of Massachusetts will experience the greatest share of impacts resulting from alternatives 3a through 6 and 10a through 10b. The region of New Bedford will be proportionately most affected followed by (depending on the alternative) Gloucester, Cape Cod, and Boston, and New Jersey. Overall impacts for New Jersey are likely to increase when the surf clam and ocean quahog analysis is folded into an aggregate analysis. The community of New Bedford will generally be most impacted by these alternatives. Medium and large vessels are more impacted by alternatives 3a and 3b while small vessels are more impacted by alternatives 5a-5d. The number of small vessels impacted by level 3 closures is significantly less than for level 1 closure. Hook, gillnet, and trap gear sectors are impacted less by level 3 closures

5.6.2.2.6 Northern Shrimp Fishery Exemption Area

The Council is proposing to eliminate the Small Mesh Fishery Exemption Area boundary for the northern shrimp fishery. All other restrictions would remain in effect. This measure is difficult to assess from the social impact perspective because impacts will vary depending on the availability of shrimp outside the boundary line and the ability of the fleet to increase revenues from shrimp fishing because of the opportunity to fish in areas east of the line.

It is important to note, however, that shrimp fishing serves as a valuable alternative to groundfishing and can be the only option for some vessels during the season. Removing the restriction on the boundary line and providing shrimp fishermen with more opportunity could serve to mitigate some of the negative social and community impacts of other groundfish restrictions. Therefore, this measure will be positive so long as it does not increase fishing mortality on groundfish species or compromise the objectives of the amendment, both of which would result in more severe restrictions for the groundfish fleet in the long-term.

The Atlantic States Marine Fisheries Commission very recently completed some additional analyses for the shrimp fishery, including information about the vessels and communities engaged in the shrimp fishery and a social impact assessment of the shrimp management measures. This information should be referenced as needed to supplement this amendment.

5.6.2.2.7 Tuna Purse Seine Vessel Access to Groundfish Closed Areas

The following information summarizes the social impact information relative to the bluefin tuna purse seine fleet (based in New Bedford and Gloucester) contained in NMFS' Highly Migratory Species FMP (1999):

- The bluefin tuna purse seine fishery lasts for only a few weeks each year. The participating boats either tie up the rest of the time or they engage in alternative fisheries.
- The purse seine fleet's success is heavily dependent on price and hence on the value of the Japanese yen. The boats are expensive to maintain and those that tie up the rest of the year accumulate costs while they do so. This is a valuable fishery and finding crew for these vessels is not a problem, indeed many of the present crew have had their berths for many years. The fish traders to whom these vessels sell depend quite heavily on them to maintain their current profit margins. However, they report that the structure of their companies is such that there would be no lost jobs even if the purse seine bluefin tuna landings were to be significantly curtailed.
- The owners and many of the crew, even some who do not reside in the community, of the four New Bedford-related purse seine vessels are integrated through kinship ties into the community involved in fishing. The fleet enjoys the respect of the extended fishing communities in both New Bedford and Gloucester. They are generally seen to have done the most to create the bluefin tuna fishery and to still contribute a great deal to both communities.

Allowing access to the closed areas without restriction should not result in significant social impacts on the purse seine fleet or the communities on which these vessels depend. Any impacts should, in fact, be positive. The tuna purse seine fishery is managed through an individual transferable vessel quota system. Each participating vessel must stop fishing when it catches its quota once the season opens on August 15 of each year. None of the measures proposed for the tuna purse seine fleet will allow vessels to catch more than their quota or increase their revenues significantly. Some positive impacts may result from increased flexibility for the tuna purse seine fleet (more options for areas in which to fish, better ability to plan business in the short-term and long-term) and decreased operating costs (see economic analysis).

5.6.2.2.8 Southern New England General Category Scallop Exemption Program

The proposed exmption program removes a groundfish plan restriction that prevented scalloping in the area south of Rhode Island unless on a scallop DAS. This program, subject to any restrictions imposed by the scallop FMP, may provide a way for vessels in the area to mitigate the impacts of rebuilding measures designed to restrict catches of winter and yellowtail flounder.

5.6.2.3 Summary and Conclusions

Many groundfish-dependent communities have been significantly impacted by groundfish regulations and the cumulative impacts of other related factors since Amendment 5 in 1993. While revenues in some communities are increasing to pre-Amendment 5 levels, vessels are experiencing more difficulties operating efficiently, maintaining year-round income, and competing in domestic and international markets. Regulations in many fisheries are splintering the fleet, "boxing them in," and in many cases, making them more dependent on groundfish than ever. The loss of fishing-related infrastructure and support services in some communities has increased concerns about their future in the fishery. Increasingly complicated regulations in all fisheries, shifts from commercial fishing towards recreation and tourism, increasing employment opportunities in other industries, and the cost of waterfront property are contributing to the loss of shoreside infrastructure in many communities. The court decision on the Framework 33 lawsuit and the resulting order for the Interim Action has increased uncertainty and instability in many communities involved in groundfish harvesting. The recent discovery about the trawl survey warp error has compromised public confidence in the scientific basis of Amendment 13. The impacts of these factors individually cannot be separated from each other.

One difficulty in assessing the social impacts of the alternatives under consideration as compared to the no action alternative is that in the short-term, negative social impacts will result from attitudes and perceptions about the new regulations, adaptations that fishermen make to the new regulations, and short-term economic losses. When compared to taking no action, none of the alternatives considered, including the porposed action, are likely to produce positive short-term social impacts. This is because most affected entities have already adapted to the 2001 groundfish regulations, and those that remain in the fishery today are adapting to the measures implemented in the Interim Action (settlement agreement). Many have altered their fishing and business practices to cover the costs associated with the additional management restrictions. Any change from the current situation will create the need for additional adaptations to be made. In addition, the alternatives proposed in Amendment 13 have been met with opposition by the vast majority of the fishing industry. Whatever alternative is selected may worsen attitudes and perceptions about groundfish management, especially given the current lack of faith in the scientific information on which Amendment 13 mortality reductions are based in part.

The management measures under consideration that have the most chance of creating positive short-term social impacts are trip limit adjustments and special access programs. To the extent that increasing the Gulf of Maine cod trip limit can reduce regulatory discarding without compromising the long-term objectives of the amendment, short-term social impacts are likely to be positive. The Closed Area II yellowtail flounder access program has potential to mitigate some of the negative impacts of DAS modifications for large vessels. The positive impacts of this program will depend on which alternative is ultimately selected to address rebuilding requirements and whether or not vessels will find it worthwhile to use their remaining DAS to travel to Closed Area II.

The management measures under consideration that have the most chance of producing negative short-term (and most likely long-term) social impacts are DAS reductions and additional year-round area closures.

This includes direct reductions in allocated and used DAS as well as the possible strategy to count DAS at a 2:1 rate for vessels fishing in the inshore Gulf of Maine on a year-round basis. DAS reductions and additional year-round area closures are likely to produce long-term impacts on affected vessels, families, and communities. Just as they have in the past, vessels and communities will likely adapt and adjust to minor modifications to the area closures, additional gear restrictions, prohibitions on night fishing, etc. However, it will be more difficult to adjust to reductions in groundfish opportunities (DAS) and the year-round closure of areas on which some vessels depend 100%. It is very likely that smaller operations that are currently operating marginally will not be able to adapt to these kinds of measures. The year-round closure of the additional GOM blocks proposed in Alternative 1 is one of the most significant measures proposed in this amendment.

The differential impacts of some of the alternatives under consideration will likely exacerbate the social impacts resulting from them. For used DAS reductions, the largest and the most active vessels will be most affected. These vessels fish primarily in offshore areas. It is possible that they will resent the sacrifices they are being forced to make to protect certain species of groundfish, some of which they may not catch in significant amounts. The DAS reductions are proposed to be applied across the board, meaning that all limited access groundfish vessels will be impacted. For area closures, the smallest vessels will be the most affected. These vessels fish primarily in inshore areas and depend on these areas heavily, as many of them cannot access offshore areas safely. It is possible that they may resent the fact that they have no opportunity to fish, while larger vessels that are less limited by their size will continue to operate, some on a year-round basis. The DAS reductions appear to have a more proportional impact when compared to the proposed area closures. However, if implemented in combination, the impacts can be expected to be devastating for affected vessels and in affected communities.

Mitigation is an important consideration given the magnitude and extent of the impacts likely to result from this action. The elements of Amendment 13 that have the most likelihood of mitigating some of the negative social impacts of the measures, at least in the short-term, include some of the capacity alternatives (permit absorption, permit transfer), the DAS leasing program, and special access programs to harvest groundfish stocks that can support more effort. However, for the most part, these programs are geared towards benefiting vessels that are larger in size and/or more financially secure. The access programs that have been proposed to date allow access to predominantly offshore areas to harvest quantities of fish appropriate for larger vessels. It is unlikely that small vessels can take advantage of such programs. The programs proposed to allow the leasing of unused DAS from vessels and/or the purchase/transfer of DAS require capital investment. Many vessels that are currently marginal will not have the financial ability to participate in such programs unless they sell their DAS, further reducing their opportunities in the groundfish fishery. There is very little, if anything, proposed in this amendment, that will mitigate negative impacts of the measures for smaller and/or currently marginal vessels. Some marginal vessels may be able to take advantage of the DAS leasing progrma – leasing out DAS to reduce their operating costs – but this option may be viewed as abandoning a way of life. There may also be some opportunities to use Category B DAS, but at present those opportunities appera to be limited.

To an extent, mitigation can also be realized from the ability for affected individuals to exit the fishery altogether and capitalize on alternative employment opportunities. For fishermen, this has always been a difficult reality to face. Fishing Family Assistance Centers can help individuals seek alternative employment and train them for new/different job skills. Centers are currently located throughout communities in Maine, as well as in Gloucester, New Bedford, and on Cape Cod. It is likely that the importance of retraining centers in these communities will increase as a result of Amendment 13, especially because these are some of the communities that will be most negatively impacted by Amendment 13. However, retraining and obtaining alternative employment cannot be assumed to fully mitigate the impacts of such a severe reduction in the groundfish fishery. Only a small percentage of affected individuals can be expected to participate in the retraining programs that the centers offer. Because of the independence and freedoms associated with fishing as an occupation and a way of life, many fishermen are not interested in retraining for shoreside employment that lacks many of the characteristics that drew them to fishing in the first place. In addition, education and language barriers will continue to limit the possibilities for retraining, despite other important skills that fishermen have acquired at sea. The declining status of today's economy exacerbates these problems.

5.7 Cumulative Effects

5.7.1 Definition of Cumulative Effects

The term "cumulative effects" is defined in the Council of Environmental Quality (CEQ) regulations in 40 CFR Part 1508.7 as:

> *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably forseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."*

5.7.2 General Approach

Cumulative effects are described with respect to:

(a) Communities – human communities engaged in the Northeast multispecies fishery;
(b) Resource – all stocks of regulated multispecies and protected species; and
(c) Habitat – benthic marine habitat, particularly Essential Fish Habitat (EFH).

Cumulative effects of gear use, non-fishing entities and actions, past management actions in the multispecies fishery, and the proposed alternatives in Amendment 13 (Fishery Administration, Capacity Reduction, Rebuilding, Recreational, and Habitat). Much of the cumulative effects discussion is derivative of the detailed Environmental Impacts sections in Amendment 13:

- Biological Impacts (Section 5.2) (including impacts on protected resources section 5.2.9)
- Habitat Impacts (Section 5.3)
- Economic Impacts (Section 5.4)
- Social Impacts (Section 5.6)

Additionally, the Affected Human Environment section (9.4) characterizes the multispecies fishery since Amendment 5 (1994), providing a baseline with which to compare predicted changes to the fishery and associated communities that will result from Amendment 13. Because of the lack of quantitative data on parameters that are potentially cumulative, a quantitative assessment of cumulative effects was not possible. Thus, the analyses that follow are qualitative in nature.

5.7.3 Summary of Non-fishing Impacts

Following is an assessment of non-fishing impacts on fish habitat and fishery resources. For fish habitat, non-fishing effects have been reviewed in the Essential Fish Habitat Amendment for Groundfish prepared by the New England Fishery Management Council (Amendment 11 to the Groundfish FMP, NEFMC 1998). Table 359 below, taken from that document, represents the review of the EFH Technical Team of the potential effects of numerous chemical, biological and physical effects to riverine, inshore and offshore fish habitats. Table 359 exhibits twelve representative classes of chemicals, three categories of biological and nineteen types of physical threats, which are categorized as low, moderate or high threats to habitat, based on their geographic location—riverine, inshore and offshore. In general, the closer the proximity to the coast, i.e., close to pollution sources and habitat alternations, the greater the potential for impact. Riverine and inshore habitats were generally categorized as moderate to high threats whereas the offshore areas were low to moderate. For the offshore area, with the exception of events such as oil spills and algae blooms, which can spread over large areas, moderate effects were generally localized to a well-defined and relatively small impact area such as oil/gas mining and dredged material disposal. Thus, only small portions of fish stocks would potentially use these sparsely located areas and would be adversely affected. For example, dredged material disposal sites, usually about 1 nm^2 in size, are managed by the U.S. Army Corps of Engineers and the U.S. EPA to minimize physical effect to the defined disposal area and allow no chemical effects at the site based on stringent sediment testing.

THREATS	RIVERINE	INSHORE	OFFSHORE
Chemical			
oil	M	M	M
heavy metals	M	M	M
nutrients	H	H	L
pesticides	M	M	L
herbicides / fungicide	M	M	L
acid	H	M	
chlorine	M	M	
thermal	M	M	
metabolic & food wastes	M	M	
suspended particles	M	M	L
radioactive wastes	L	M	M
greenhouse gases	M	M	M
Biological			
nonindigenous / reared species	M	M	M
nuisance / toxic algae	M	H	M
pathogens	M	M	M
Physical			
channel dredge	M	H	
dredge and fill	H	H	
marina / dock construction	M	H	
vessel activity	M	H	L
erosion control			
bulkheads	M	M	
seawalls		M	
jetties		M	
groins		M	
tidal restriction	M	H	
dam construction / operation	H	M	
water diversion			
water withdrawal	H	M	
irrigation	M	M	
deforestation	H	M	
mining			
gravel/mineral mining	M	M	M
oil/gas mining	L	M	M
peat mining	L		
debris	M	M	M
dredged material disposal	L	M	M
artificial reefs	L	M	M

Table 359 - Potential non-fishing threats to fish habitat in the New England region prioritized within regions (H = high; M = moderate; L = low)2

[1] From NEFMC (1998)

[2] Prioritization developed by compilation of *EFH Technical Team* survey

For fishery resources, there are several non-fishing threats that could have a direct and/or indirect impact on the groundfish stocks. Several of the items identified as non-fishing threats to fish habitat, identified in Table 359, could also pose a threat to groundfish stocks, such as the oil spills, pesticides, and radioactive wastes. Similar to the discussion above on non-fishing impacts to fish habitat, generally the closer the proximity of groundfish stocks to the coast, the greater the potential for impact (although predation, a non-fishing impact, would be one threat that would occur everywhere). Many groundfish species reside in both inshore and offshore areas at different stages of their lives and during different seasons throughout the year. However, some stocks, such as SNE winter flounder, live out a large portion of their lives closer to shore and, therefore, may likely be impacted by inshore threats to a greater degree than some of the other groundfish species. In the offshore areas, such effects would likely be low because the localized nature of the effects would minimize exposure to organisms in the immediate area.

An additional inshore threat of note would be the effect on fishery resources presented by power plants. The operations of power plants are thought to be especially of consequence to fish eggs, larvae and juveniles. Entrainment, or intake of cooling seawater for the purposes of cooling power plant reactors, is known to draw in eggs and larvae and, therefore, could have a negative impact on groundfish resources that spawn in areas in close proximity to active power plants. An additional threat associated with power is the discharge of warm. This thermal discharge is believed to have a negative impact on reproduction capability and recruitment of affected fishery resources.

Although still speculative at this time, foreseeable future non-fishing threats to fishery resources could include global warming and the effects that this may have on water temperature. The impacts to the fish stocks are not certain and therefore could not be incoporated into this assessment. The possibility of windmill construction in marine waters for the purposes of harnessing alternative means of energy could also have an impact on fishery resources, especially as it relates to disruption of habitat. This is the subject of a forthcoming EIS being prepared by the Army Corps of Engineers. The impacts of this project to the fisheries are yet to be determined.

5.7.4 Summary of Fishing Gear Effects on EFH

The effects of mobile bottom-tending gear (trawls and dredges) on fish habitat have been recently reviewed by the National Research Council (NRC 2002). This study determined that repeated use of trawls/dredges reduce the bottom habitat complexity by the loss of erect and sessile epifauna, smoothing sedimentary bedforms and bottom roughness. This activity, when repeated over a long term also results in discernable changes in benthic communities, which involve a shift from larger bodied long-lived benthic organisms for smaller shorter-lived ones. This shift also can result in loss of benthic productivity and thus biomass available for fish predators. Thus, such changes in bottom structure and loss of productivity can reduce the value of the bottom habitat for demersal fish. These effects varied with sediment type with lower level of impact to sandy communities, where there is a high natural dynamic nature to these bedforms, to a high degree of impact to hardbottom areas such as bedrock, cobble and coarse gravel, where the substrate and attached epifauna are more stable. In the Northwest Atlantic, the more valued groundfish habitat is located in areas where there is a high percentage of gravel and cobble (NREFHSC 2002).

Use of trawls and dredges are common in inshore and offshore areas and somewhat less common in riverine areas. Section 9.3.1.2 of this document discusses the numerous types of gear used in estuarine and offshore habitats. This section indicates that mobile bottom-tending gears are commonly used in most inshore and offshore habitats. In the Northeast, otter trawls are used to prosecute most MSA managed fisheries including: Northeast Multispecies; Sea scallops; Monkfish; Mackerel, squid and butterfish; Summer flounder, scup and black seabass; Bluefish; and Spiny dogfish. Scallop dredges are used in the Sea scallop fishery and hydraulic clam dredges are used in the Surf clam and Ocean quahogs fisheries. Smaller trawls are used in inshore areas and lower estuaries, which are managed by states and not subject to the MSA. In addition, some states allow smaller dredges are used for harvesting oysters, bay scallops, sea urchins, quahogs, and mussels. Hydraulic dredging for softshell clams and bottom trawling for shrimp is also accomplished in certain nearshore and riverine habitats.

It is assumed for this analysis that the effects of gear are generally moderate to high in the riverine, inshore and offshore areas, depending upon the type of bottom and the frequency of fishing.

5.7.5 Summary of Existing Threats to Protected Resources:

Table 360 summarizes the past and current threats for these species as described in Section 9.2.2 and the Biological Opinion (NMFS 2001). It should be noted that all these species have a special status because of threats to their continued sustainability. Six of the large whale species (Right, Humpback, Fin, Sei, Blue and Sperm) and three sea turtles (Leatherback, Kemps' Ridley and Green) are listed as endangered under the Endangered Species Act. The Loggerhead is listed as threatened while two other species, Harbor Porpoise, Barndoor Skate, are candidates for listing. The remaining mammal species are protected under the Marine Mammal Protection Act. The Right Whale continues to be at the highest risk for extinction because of its low numbers and low reproductive rates.

For the Right, Humpback, Fin, and Minke whales, ship strikes and fishing gear entanglements continue to be the most likely sources of injuries and mortality. Gear entanglements occur in the vertical buoy lines of sink gillnet and pot/trap gear, the groundlines of pot/trap gear, and also in the net panels of gillnet gear. Other species such as Sei, Blue, and Sperm whales are vulnerable too but less strikes/entanglements are recorded. Over the period 1996-2000 within U.S. Atlantic waters, an average of 3.2 whales (right, humpback, fin, sei, sperm, blue, and Minke combined) were killed by ship strikes and 7.8 were killed or suffered injuries likely to cause death as a result of gear entanglements (Waring et. al, 2002). Mobile bottom trawls, which are common for the groundfish fishery, are less of a concern for these large whale species. Other marine mammals such as Harbor Porpoise, dolphins and seals are also at risk to be entangled in net gear (seines, gillnets, drift nets). Turtles have been entangled in these and are particularly vulnerable to shrimp trawls, pound nets and bottom trawls. Shrimp trawls are now required to use turtle-excluder-devices to reduce the potential for entanglement.

These species are also affected by habitat alternation/destruction. Species such as turtles may be more prone to such impacts because their nests are particularly vulnerable to disturbance or predation. The impacts of pelagic habitat alteration on these species are less known. Water quality in coastal areas is particularly vulnerable to coastal pollution from nutrients, which can alter the phytoplankton and the food of species such as the Right whale, and toxic contaminants. The latter can be accumulated through prey species and cause adverse effects to a predator(s) higher in the food web, such as PCBs and DDT which are suspected of causing reproductive failures in many vertebrates including marine mammals (Reijnders and Aguilar, 2002)). The potential impact of pollution is more likely problematic in nearshore areas closer to the sources such as land runoff, sewer outfalls and urbanized areas. Nutrients can also promote toxic phytoplankton blooms, which have been known or suspected in killing humpback whales and other marine mammals (Geraci et. al, 1990; Harwood 2002). These and other factors potentially have had cumulative adverse effects on all these species to varying degrees. Because of a lack of cause-effect data, little is know how much these factors have contributed to their special listing. The third column of Table 360 lists the cumulative impacts for each of the alternatives evaluated in this Amendment. The detailed evaluation of effects of each alternative on protected resources is provided in Section 5.2.9 and is summarized in Table 363 - Table 366.

Species	Status	Threats			
		Ship Strikes	Gear Entanglement	Habitat	Other
Right Whale	Endang Highest risk	High Potential	High potential due sink gillnets, pots, traps	Unkown: Water Quality: Nutirents; Toxic contaminants; Biotoxins; Noise	Unknown: Low Genetic diversity; Low reproductive rates; Reduction/ Competition of prey; Harassment
Humpback	Endang	High Potential	High potential	Unkown: Water Quality: Nutirents; Toxic contaminants; Biotoxins; Noise	Unknown: Reduction/ Competition of prey; Harassment
Fin	Endang	High Potential Mortality Less Certain	High potential Mortality Less Certain	Unkown: Water Quality: Nutirents; Toxic contaminants; Biotoxins; Noise	Unknown: Reduction/ Competition of prey; Harassment
Sei	Endang	Potential but few recorded instances	Potential but no recorded instances	Offshore Species Less likely but still vulnerable to Offshore Development	Unknown: Reduction/ Competition of prey; Harassment
Blue	Endang	Potential but few recorded instances	Potential but few recorded instances	Offshore Species Less likely but still vulnerable to Offshore Development	Unknown (no data): Ice entrapment
Sperm	Endang	Potential but few recorded instances	Potential but few recorded instances	Offshore Species Less likely but still vulnerable to Offshore Development	
Minke	Protected under MMPA	Potential but few recorded instances	Sink Gillnets known threat; Pot/Trap Gear	Unkown: Water Quality: Nutirents; Toxic contaminants; Biotoxins; Noise	Aboriginal subsistence whaling on West Greenland stock (non-U.S. stock)

Table 360 - Summary of Threats to Protected Species Potentially Affected Amendment 13 Multispecies Plan.

Harbor Porpoise	Protected under MMPA; ESA Candidate Species	Potential but few recorded instances	Sink Gillnets known threat	Biotoxins: Noise	Unknown: Reduction/ Competition of prey; Harassment
Atlantic White-sided Dolphin, Pelagic Delphids	Protected under MMPA	Potential but few recorded instances	Sink Gillnets known threat; Frequent Takes with longline and Trawl Gear	Offshore Species Less likely but still vulnerable to Offshore Development: Biotoxins; Noise	
Harbor and Gray Seal	Protected under MMPA	Potential but few recorded instances	Sink Gillnets known threat	Unknown: Possible Biotoxin exposure	Disturbance at haul out sites/Harassment
Harp Seal	Protected under MMPA	Potential but few recorded instances	Sink Gillnets known threat	Unknown: Possible Biotoxin exposure	Fishery in Canada
Leatherback, Kemp's Ridley, Green Turtle	Endang	High Potential Boats and Ships	Bottom and midwater Trawls, seine nets, longlines gillnets drift nets, pound nets; Shrimp Trawls impact reduced with TEDs; Lobster/Crab Trap, pots;	Loss of Nesting Habitat; Consumption of ocean debris; Water Quality: Habitat Destruction/degradation; (Beach erosion/nourishment); Toxic contaminants; increased human presence; Noise	Egg Predation/Exploitation; Cold Stunning (Leatherback less than others); Hurricanes destroying beaches
Loggerhead	Threatened	Same as above	Same as above	Same as above	Same as above
Barndoor Skate	Candidate Species	NA	Overfished Species	Bottom Mobile gear effects on habitat/prey	Limited Reproductive capacity

Table 360 - Summary of Threats to Protected Species Potentially Affected Amendment 13 Multispecies Plan.

5.7.6 Review Of Past Groundfish Management Actions That Affected Groundfish Resources, Fishing Communities, And EFH

5.7.6.1 Impacts associated with Groundfish Resources and Fishing Communities

The groundfish fishery of New England in the 19th Century was originally accomplished on sailing vessels using such low impact techniques such as handlines, jigging and later longlines. When steam-powered vessels came into prominence in the early 1890s, mobile gear such as trawls were found to be very efficient harvesters of groundfish. By 1930, otter trawls became the dominant gear. As a result of more efficient gear, faster and larger vessels and better preservation, haddock landings, for example, grew from 20,000 mt/year in 1900 to over 100,000 mt/yr in 1920 (Collette & Klein-MacPhee, 2002). Using landings as an indictor of fishing effort, one can see how trawling has increased over a relative short timeframe. Fishing effort expanded in the 1950s due to the influx of foreign vessels after World War II, and in the late 1970s/early 1980s, when the domestic fishery expanded in the wake of the Magnuson Act of 1976. There are currently several gear types employed in the multispecies fishery. As reported in the Amendment 13 Affected Environment section, the major gear types used now are bottom trawl, bottom longline, hook and line, and sink gillnet gear.

Although management measures for groundfish were first enacted in 1977 under the original Groundfish Fishery Management Plan, the dramatic increase in larger vessels, bigger gear and electronic aids such as fishfinders and navigation equipment, contributed to a greater efficiency and intensity of fishing, which, in turn, resulted in a precipitous drop in landings during the 1980s to an all-time low in the early 1990s. Table 361, below, describes the major regulatory actions taken to manage the New England groundfish fishery since the original Magnuson Act was enacted and their effect on groundfish resources, community, and EFH. The first several years of groundfish management included annual and quarterly catch quotas for cod, haddock and yellowtail flounder, quota allocations by vessel class, and trip limits. The quota and trip limits imposed during the inception of the Groundfish FMP led to frequent fishery closures of one or more segments of the fishing fleet, interrupting the normal activities of the industry. Consequently, this form of management frequently imposed both economic inefficiencies and hardships on the industry, which led to a breakdown in support of these measures. This in turn, led to widespread misreporting and non-reporting by the industry as a way to circumvent the regulations. Starting in the early 1980's a new management program was implemented through the 1982 Interim Fishery Management Plan. This plan, and the next several groundfish actions (through Amendment 4 in 1991) managed the groundfish fishery (now expanded to include 13 species) primarily through seasonal closures and minimum mesh and fish size restrictions. However, these measures proved not enough since the condition of the resources, especially cod, haddock and yellowtail flounder continued to decline to record low levels.

To end overfishing and address the severe decline in the groundfish resources and the influx of more and larger vessels, the Council began developed of Amendment 5 to the FMP. This action, which became effective in 1994, implemented a moratorium on permits as well as an effort-control program that proposed to reduce a vessel's days-at-sea (DAS) by 50% over a 5-7 year period. Amendment 5, thus, was the first action to restrict both access and effort in the multispecies fishery. The FSEIS for Amendment 5 determined that this action may have significant effects on a substantial number of small entities, specifically those vessels less than 45', which, at the time, consisted of 36% of the qualified vessels. Although the FSEIS demonstrated that Amendment 5 provided economic and social benefits to the fishery in the long-term, vessels were expected to incur significant short-term loses in revenue.

Despite implementation of Amendment 5, however, stocks continued to decline rapidly and a "Special Advisory" was issued by the Northeast Fisheries Science Center in 1994 stating that Amendment 5 was "too little, too late" to address the critical status of many of the groundfish stocks. In response, the Council requested that NMFS implement an emergency action to close, on a year-round basis, three large areas to all vessels capable of catching groundfish (Closed Area I, Closed Area II, and the Nantucket Lightship Closed Area), while it developed Amendment 7 to the FMP. NMFS implemented the emergency action to close these three areas in December of 1994. These closure areas have been thought to have a major beneficial effect on groundfish stocks, as they afforded protection over large areas and for extended amounts of time. Indirect benefits to other species accrued from these closures as well, such as protection of sea scallops. Although there were large benefits attributed to these closures, it is important to note that they may have had a negative effect on other groundfish stocks as vessels moved elsewhere to fish. Framework 9, implemented in 1995, extended the emergency action permanently and also implemented a prohibition on all small mesh fisheries in the GOM, GB and SNE Regulated Mesh Areas, unless it was determined that the fishery had less than 5% bycatch of regulated species. Through elimination of small mesh fisheries where groundfish bycatch exceeded 5%, discard of groundfish was largely reduced by vessels fishing in non-groundfish fisheries. Amendment 7, implemented in 1996, accelerated the Amendment 5 DAS effort-reduction schedule and expanded the 5% bycatch rule to include a prohibition on all non-DAS fisheries, further reducing bycatch of regulated species. Amendment 7 also implemented recreational fishing restrictions and framework adjustment criteria that would allow management measures to be implemented under a more accelerated mechanism than through an amendment. These actions, in combination, have reduced fishing effort significantly and have provided large areas of year-round protection, especially on Georges Bank, for several species of groundfish. In response, the status of several groundfish stocks have improved over the past several years and landings have increased as a result (see Affected Environment section). Similar to Amendment 5, the FSEIS for Amendment 7 specified that this action was expected to have a significant impact on a substantial number of small entities in the short-term, with higher, long-term benefits accruing to the industry and to the Nation. Overall revenues were projected to be reduced by 10-25% in the first 3 years, with differential effects on gear groups, with trawlers projected to be more disadvantaged than others are.

Following Amendment 7, there have been several framework adjustments implementing further restrictions and, in some cases, extensive restrictions in the groundfish fishery. Due to concerns primarily regarding the status of GOM cod, Frameworks 20, 25, 26, 27, 31 and 33 implemented additional management measures to further protect this stock. These measures included new GOM seasonal and year-round closures, gillnet effort-reduction measures (including limits on the number of allowable nets), and adjustments of the GOM cod trip limit. Additionally, measures in these actions also increased the haddock daily trip limit and increased the minimum square mesh size throughout the GOM/GB/SNE Regulated Mesh Areas. Because the main focus of these actions was to protect GOM cod, the socio-economic impact was primarily felt within communities located in the states of Maine, New Hampsire and Massachusetts, due to the proximity of these communities to the GOM fishing areas.

In response to a Federal Court decision in the case of Conservation Law Foundation, et al. V. Evans, et al., NMFS, in August 2002, implemented management measures consistent with a Settlement Agreement through an interim final rule. Measures contained in the interim rule included a freeze of DAS at the highest annual level used during fishing years 1996-2000 and a 20% cut from that level; increased gear restrictions for certain gear types, including gillnets, hook-gear, and trawl nets; modifications and additions to the closure areas; limits on yellowtail flounder catch; and more restrictive recreational fishing measures. Biological impacts of the "Settlement Agreement" management measures that were first implemented on August 1, 2002, vary by species. Based on a quantitative analysis only, the July 2002 EA estimated the resultant decrease in fishing mortality to range from 1% for GB winter flounder and 16% for GOM cod. It has been recently projected in the June 2003 EA, completed for an Emergency Action to extend the August 2002 interim rule measures, that, based upon the number of DAS used in 2002, continuation of the Settlement Agreement for the duration of the 2003 fishing year would result in a 25-35% reduction in fishing effort.

Measures implementing the Settlement Agreement have further protected several groundfish species, most notably GOM cod, and increased the likelihood of timely stock rebuilding. A particularly important aspect of these rules is the control of latent DAS. The DAS freeze has significantly limited the extent to which latent DAS can be activated and, therefore, has limited the extent to which the increases in fishing mortality from the use of such DAS could undermine efforts to control fishing mortality. The DAS allocations for the 2002 fishing year were 45.7% less than the DAS allocations for the 2001 fishing year (including carryover days). Preliminary estimates made in June 2003 calculated a 37% decline in DAS use during the 2002 fishing year (compared with the 2001 fishing year). While the combination of measures implemented since the adoption of Amendment 5 have improved stock status (increasing biomass and reducing fishing mortality) for many stocks, as discussed in section 9.2.1.1, the improvement has not been achieved for all stocks.

Overall, the DAS restrictions resulting from the Settlement Agreement impacted most, those vessels that rely on groundfish for a majority of their income. For vessels with high dependence on groundfish income, the adverse income effects of the Settlement Agreement were nearly twice that of vessels that rely on groundfish for less than half of their annual fishing income. Estimated revenue losses were greatest for vessels bordering the GOM (Gloucester, Portland, Portsmouth, Chatham/Harwich). DAS reductions were largest for the home port states of New Jersey, New York, Maine, and Massachusetts (in descending order). Charter/party vessels experienced a decrease in the number of trips booked, however the majority of the economic impacts were borne by approximately 20-25 charter/party operators whose primary business is in offering groundfish trips.

Bottom trawl, longline gear and hook-gear are classified as Category III fisheries under the Marine Mammal Protection Act and are, therefore, determined to have a remote likelihood of, or no known, incidental mortalities and serious injuries of marine mammals. Gillnet gear has been categorized as a Category I fishery; a fishery that has been determined to have frequent incidental mortality or serious injury of marine mammals. Many of the groundfish actions discussed above have had an overall beneficial impact on protected resources. For instance, the DAS reductions have significantly reduced effort in this fishery. Extensive area closures to protect groundfish stocks, including harbor porpoise closure areas specific to gillnet vessels, and reductions in fishing gear, such as reductions in allowable gillnet gear, have all contributed to benefiting protected resources.

Development of other recent management actions, such as for whiting and monkfish, have also benefited groundfish stocks as they have likely reduced groundfish discards (e.g., through the development and implementation of a whiting grate fishery, and coupling of multispecies and monkfish DAS). Also, it should be noted that a vessel buyout program, starting in 1996, has contributed to reducing the socio-economic impacts on small entities associated with the groundfish actions.

5.7.6.2 Impacts associated with EFH

The increased intensity of trawling also has been correlated with habitat impact (Jennings et al. 2001, 2002; Thrush et al., 1998; Collie et al. 1997, 2000). Mobile gear such as otter trawls do have a more direct impact on the bottom habitat by disturbing or scraping the bottom substrate and removing, damaging or destroying benthic organisms at the sediment surface or just below. The vulnerability of the various life stages and species to this and other mobile gear are summarized in section 9.3.1.2 of this document. Even as early as the 1920's, concerns were raised over the ecological damage to bottom dwellers from increasing levels of trawling (Collette & Klein-MacPhee, 2002). Although management measures were taken as early as 1977 to control groundfish catches, there was no dedicated effort to regulate impacts to fish habitat until 1996 when the Sustainable Fisheries Act (SFA) was implemented to, in part, minimize the adverse effects of fishing to the "essential fish habitat" (EFH) of managed species. However, management measures developed to date to control fish catch, effort and capacity have incidentally benefited habitat by reducing bottom contact time of mobile bottom-tending fishing gear.

In general, measures such as area closures (depending upon size of area, time closed and habitat type within), gear restrictions/alterations, permitting restrictions, reductions in effort allowed or days at sea (DAS), and possession/trip limits can clearly benefit habitat. Some measures such as, effort monitoring, crew limits, onboard observers, recreational measures, and Total Allowable Catches (TAC) limits may also benefit habitat. Other measures, such as an increase in fish and mesh size limits, although they are designed to meet stock rebuilding objectives, may have negative habitat effects since they may encourage increased fishing effort to meet catch limits if DAS are not limiting. As noted in Table 361, each major management actions are characterized according to its probable benefit on habitat. The actions that are believed to have the greatest benefit to habitat have included Amendment 5 in 1994, due to the moratorium on new entrants and DAS reductions; Emergency Action in 1994, due to the year round closures and prohibition of scallop vessels in closed areas reductions and elimination of small mesh fisheries which were 5% or greater of the catch of regulated species; Framework 9, due to its continuance of the 1994 management measures on a permanent basis; Amendment 7, due to its accelerated DAS reductions and closer areas and expansion of the 5% bycatch rule to all fisheries; Framework 25, due to closure areas; Framework 27, due to closure areas and gear restrictions; and the 2002 Interim Action, due to additional DAS cap on use of latent effort; and expansion of the closure areas. Other management actions are believed to have moderate to negligible benefits in their protection of EFH. However, NMFS believes that the combined effect of the noted significant and moderate measures that have been implemented during the last 10 years has been to enhance the protection and preservation of EFH.

It should be kept in mind that the benefit of closure areas might be limited by the fact that when areas are closed, effort is often displaced to other fishing areas. This may reduce the beneficial effect of this management measure over a larger area, i.e., impacts in the closure area may be reduced but impacts to other areas may be increased. On the other hand, if reductions in DAS cause a shift of effort to other fisheries such as whiting, squid/mackerel/butterfish, or herring, these fisheries would have less impact to EFH since they use either a raised footrope (in some areas) on the trawl or use mid-water trawls. However, if the shift is into the scallop fishery or other fisheries utilizing bottom-tending mobile gear, then the impacts may be the same or greater as those caused by bottom trawling. Little is actually known of the true impacts of these management measures. However, it is reasonable to assume a positive benefit from the groundfish management measures that are currently in place will continue in the foreseeable future.

DATE	ACTION	FEATURES THAT AFFECT RESOURCES, HABITAT AND COMMUNITIES	RESOURCE BENEFITS	HABITAT BENEFITS	COMMUNITY IMPACTS
1977	Original FMP	Cod, haddock and yellowtail annual and quarterly catch quotas Quota allocations by vessel class Trip or weekly catch limits	Moderate	Negligible	Moderate - High
1982	Interim Plan	George Bank Closed Areas (seasonal) Minimum mesh size requirements when fishing for cod, haddock or yellowtail flounder in GB and portions of the GOM (5.5") Minimum fish size requirements Permit requirements	Moderate-High	Low	Moderate-High
1986	Multispecies Plan	Inclusion of pollock, redfish, winter flounder, American plaice, witch flounder, windowpane flounder, and white hake Additional minimum fish size restrictions Extensions of GB spawning areas closures to protect haddock (seasonal) A SNE closure to protect yellowtail (seasonal)	Moderate	Moderate	Moderate
1987-1991	Amendments 1-4	Closure of the Southern New England/Mid-Atlantic Yellowtail Area during March-May Extension of GB RMA Minimum mesh size requirements in SNE Exclusion of scallop dredge vessels from SNE closure Minimum fish size changes Gear restrictions in the Northern Shrimp fishery Inclusion of silver hake, red hake, and ocean pout	Moderate-High	Moderate	Moderate-High
1994 (01/03/94)	Emergency Action	Implementation of a 500-lb haddock trip limit Expansion of CAII in area and time (from 4 month to 6 months) Prohibition on scallop dredge vessels from possessing haddock during January-June Prohibition on pair-trawling for multispecies	Moderate	Low	Moderate

Table 361 - History of Manageme nt Actions and Associated Habitat Benefits

DATE	ACTION	FEATURES THAT AFFECT RESOURCES, HABITAT AND COMMUNITIES	RESOURCE BENEFITS	HABITAT BENEFITS	COMMUNITY IMPACTS
1994	Amendment 5	Implementation of '94 Emergency Action year-round Moratorium on new entrants to the multispecies fishery An effort reduction program for most vessels whereby historical DAS would be reduced by 50% over a 5-7 year period SNE and MidAtl Regulated Mesh Area (RMA) (5.5") Increase mesh in GOM/GB RMA (6.0") Minimum fish sizes Suspension of CAI (except for gillnet vessels) Finfish excluder requirement for shrimp vessels Mandatory reporting and observer requiremenrts Framework adjustment provisions	High	High	High
1994	Amendment 6	Implementation of March1994 Emergency Action measures on a permanent basis	Moderate	Moderate	Moderate
1994	Emergency Action	Year-round closure of redefined CAI, the Nantucket Lightship Closed Area and CAII - to protect cod, haddock and yellowtail flounder Prohibition on scallop vessels from fishing in the closed areas A small mesh prohibition - disallowance on any fishery utilizing mesh smaller than the minimum mesh size requirements, with the exception of fisheries that have been determined to have a catch of less than 5 % by weight of regulated species Prohibition on retaining regulated species w/ sm mesh Increase in SNE mesh size (6.0") Winter flounder exemption in state waters	High	High	High
1995	Framework 9	Implementation of December 1994 Emergency Action measures on a permanent basis	High	High	High

Table 361 - History of Management Actions and Associated Habitat Benefits

DATE	ACTION	FEATURES THAT AFFECT RESOURCES, HABITAT AND COMMUNITIES	RESOURCE BENEFITS	HABITAT BENEFITS	COMMUNITY IMPACTS
1996	Amendm ent 7	Acceleration of Amendment 5 DAS reduction schedule Elimination of exemptions to effort control program Implementation of seasonal GOM closures Implementation of a 1,000 lb haddock trip limit Expansion of the 5% bycatch rule, where vessels fishing in the GOM/GB/SNE RMAs are allowed to fish only in an exempted fishery, under a mults or scallop DAS ,or under the Small Vessel permit category Establishment of an annual target TAC for cod, haddock and yellowtail stocks, and expansion of framework provisions to set annual TACs Restrictions on party/charter and recreational vessels	High	High	High
1997 (05/01/97)	Framework 20	Implementation of GOM cod daily trip limit (1,000 lb) Seasonal increase in haddock daily trip limit (1,000 lb) Gillnet effort-reduction measures, including net limits	Moderate	Moderate	Moderate
1998 (04/09/98)	Framework 24	Adjustment to GOM cod trip limit – vessels must remain in port & run clock to account for cod overage Implementation of DAS carry-over provision Implementation of NAFO exemption	Low	Low	Moderate
1998 (05/01/98)	Framework 25	Implementaiton of GOM Inshore Closure Areas Implementation of year-round Western GOM Closure Area Addition of a seasonal offshore GOM closure area (Cashes Ledge Closure Area) Reduction in the GOM cod daily trip limit (700 lb)	High	High	High
1999 (01/19/99)	Framework 26	Expansion of April GOM Inshore Closure Area Addition of seasonal inshore GOM and Georges Bank area closures	Low	Low	Moderate
1998	Amendment 11	Designated EFH for Multispecies Required Federal agencies to consult with NMFS on actions that may adversely effect EFH. NMFS provides recommendations to avoid or minimize impacts to EFH	Low	High	Low

Table 361 - History of Management Actions and Associated Habitat Benefits

DATE	ACTION	FEATURES THAT AFFECT RESOURCES, HABITAT AND COMMUNITIES	RESOURCE BENEFITS	HABITAT BENEFITS	COMMUNITY IMPACTS
1999 (05/01/99)	Framework 27	Elimination of the Northeast Closure Area Establishment of seasonal inshore GOM Rolling Closure Areas of greater size and duration than Inshore Closure Areas (from 1 month 2 months) Reconfiguration of the seasonal Cashes Ledge Closure Area and expansion in time (from 1 to 4 months) Exemption for scallop dredge vessels to fish within the GOM Rolling Closure Areas and Cashes Limitation on roller and rockhopper trawl gear to a maximum diameter of 12" within a GOM inshore area Decrease in the GOM cod daily trip limit (200 lb), w/ mechanism to reduce further if necessary (reduced to 30 lb on 5/28/99) Increase in the haddock daily trip limit (2,000 lb) Increase in GOM/GB/SNE square mesh size (6.5")	Moderate-High	Moderate	Moderate-High
1999 (07/29/99)	Interim Rule	GOM cod daily trip limit revision (100 lb/500 lb max) DAS running clock revised-cod overage limit to 1 day	Moderate	Low	Moderate
1999 (11/15/99)	Amendment 9	Prohibition on the use of Brush-Sweep Trawl gear Inclusion of halibut into the FMP Possession and size limit on halibut - 1 fish (36")	Moderate	High	Moderate
2000 (01/05/00)	Framework 31	Increase in GOM cod daily limit (400 lb/4,000 lb max) Additional February inshore GOM closure Extension of '99 Interim rule running clock measure	Moderate	Low-Moderate	Moderate
2000 (05/01/00)	Framework 33	Addition of a Georges Bank Seasonal Closure Addition of 2 1-month conditional GOM closure areas Increase in haddock daily trip limit (3,000 lb)	Moderate	Negligible	Moderate

Table 361 - History of Management Actions and Associated Habitat Benefits

DATE	ACTION	FEATURES THAT AFFECT RESOURCES, HABITAT AND COMMUNITIES	RESOURCE BENEFITS	HABITAT BENEFITS	COMMUNITY IMPACTS
2002 (05/01/02)	Interim Action (Settlement Agreement)	Restriction on vessels using more than 25% of their DAS allocation during May-July 2002 Modification of DAS clock – all vessel trips 3-15 hours counted as 15 hours during May-July 2002 Year-round closure of Cashes Ledge Area Closure Expansion of Rolling Closure Area III and IV Prohibition on front-loading the DAS clock Increase in GOM trawl (codend) & gillnet mesh (6.5") Limitations on Day gillnets Restrictions on party/charter and recreational vessels	High	Moderate-High	High
2002 (08/01/02)	Interim Action (Settlement Agreement cont'd)	May 2002 interim measures continued Establishment of "used DAS baseline" and reduction of 20% from this baseline Freeze on Handgear permits & trip limit reduction Elimination of GOM January & February seasonal closure areas Increase in SNE trawl (codend) mesh (7.0/6.5" sq/diamond) Increase in GB gillnet mesh (6.5") Further limitations of both Day & Trip gillnets Increase in SNE gillnet mesh (6.5") Longline gear restrictions - prohibition on de-hookers (crucifiers) w/ < 6" spacing between fairlead rollers, hook size restrictions, and limit on number of hooks Increase in commercial cod fish size (22") Possession limits and restrictions on yellowtail catch Increase in GOM daily cod trip limit (500/4000 lb max)	High	Moderate	High

Table 361 - History of Management Actions and Associated Habitat Benefits

5.7.7 Cumulative Effects of Amendment 13 Measures

Table 363 - Table 366 summarize the impacts of Amendment 13 alternatives on communities, groundfish stocks, protected species and habitat. Table 367 summarizes cumulative effects of gear use, non-fishing entities and actions, past management actions in the multispecies fishery, and the proposed alternatives in Amendment 13 (Fishery Administration, Capacity Reduction, Rebuilding, Recreational, and Habitat). This section further discusses the content of these summary tables.

5.7.7.1 Fishery Program Administration Measures

The majority of the fishery administration measures have only limited or negligible effects on communities, stocks, protected species, and habitat. The additive effects of these measures in conjunction with other Amendment 13 alternatives, including measures to address stock rebuilding and capacity issues, as well as past actions in the groundfish fishery are low or negligible. In general, it is unlikely that the Fishery Program Administration measures will have any adverse cumulative effects on protected resources because the measures are primarily administrative. Should a new fishing year be selected, two options for DAS proration are considered. Neither option will result in an increase in DAS use compared to the no action alternative. Otherwise, cumulative effects of these measures ranged from none to negligible. The special access programs and DAS leasing program may slightly reduce the net benefit of rebuilding alternatives for stocks but alleviate the burden of increased regulation on communities to a limited extent. Their cumulative effects may differ among stocks and fishing communities. Those fishery program administration measures which are likely to have cumulative effects are discussed below. If the cumulative effects of a measure on communities, resources, or habitat, are likely to be negligible or none, this is indicated briefly in the following discussion.

<u>Fishing Year (Not selected)</u>
A change to the fishing year will not have any cumulative effects on communities, resources, or habitat.

<u>DAS Proration (Not selected)</u>
Because it allows for 10 carry-over DAS, DAS proration Option 1 may have a very limited negative cumulative effect on the resource (groundfish stocks), with no appreciable cumulative effects on communities or habitat. Other DAS proration options will have negligible cumulative effects on communities, resources and habitat.

<u>Periodic Adjustment Process (Proposed action)</u>
Modifying the current framework adjustment process will not have any cumulative effects on communities, resources, or habitat.

<u>US/CAN Resource Sharing Understanding (Proposed action)</u>
While the US/CAN resource sharing understanding is likely to have impacts on allocation of shared fishery resources, the cumulative effects of this program are likely to be negligible. Because the proposed agreement does not reduce overall effort or establish additional gear restrictions, closures, or effort controls, there will be no cumulative effects on the resource and habitat.

<u>Administration of Certified Bycatch/Exempted Fisheries (Proposed action)</u>
This alternative establishes closer monitoring and review of bycatch and exempted fisheries. This action will not have any cumulative effects on fishing communities. Because of an increased administrative burden associated with this alternative, it may have small negative effects on NMFS administrative staff and analysts. With closer review and monitoring of bycatch/exempted fisheries, violations of the 5% bycatch standard and other issues will be identified in a more timely and effective manner. Improvements in data and information quality may have positive, indirect cumulative effects on the resource in the long term. There are no cumulative effects on habitat associated with this alternative.

Special Access Programs (Proposed action)

The Georges Bank yellowtail flounder SAP allows vessels to access a portion of Closed Area II to harvest a limited quantity of yellowtail flounder. This program will increase fishing mortality on GB yellowtail to a small extent, resulting in minimal negative impacts on the stock. Affects of this SAP on other stocks are negligible. The SNE/MA winter flounder incidental catch program allows fluke vessels to retain a small portion of incidental catch of winter flounder on directed fluke trips. This program is unlikely to increase mortality on winter flounder, since the winter flounder retained would have otherwise been discarded. The U.S./Canada resource sharing agreement SAP encourages U.S. vessels to fish in area 5Zjm so that the United States will take full advantage of their allocated quota. The specific measures chosen for this program may result in increased fishing effort on Georges Bank cod and potentially increased incidental catch of other species. The cumulative effects of this program on resources may be negative but low. The Closed Area I Hook Gear SAP will increase catches of haddock, but will provide additional revenues to small boat hook fishermen and their communities. Special access programs are positive for communities which rely on fishing, since they provide increased harvesting opportunities and potentially increased flexibility in determining when and where to fish. Their cumulative effects on communities, however, are likely to be only slightly positive or negligible, since these programs focus on specific harvesting sectors/fisheries and do not benefit the fishery as a whole. The cumulative effects of special access programs on habitat are negligible.

Closed Area Administration (Proposed action, in part)

The options related to defining the rationale for closed areas and reviewing year-round closed areas are administrative in nature and are unlikely to have any appreciable cumulative effects on the resource, communities, or habitat. Options determining the extent to which closed areas may be accessed may have differing effects, but no changes are adopted by this Amendment. Options 1-4 allow access of current multispecies exempted gear into year-round closed areas, with certain restrictions. These options will not have a cumulative effect on the resource or habitat, since they do not liberalize existing gear restrictions and any further restrictions on the use of certain gear types in closed areas are likely to have small positive effects. Option 5 extends the restriction on access to year-round closures to all gear types. This may have small positive cumulative effects on habitat in closed areas and for species with EFH-designations in closed areas. Options which prohibit certain gear types from accessing closed areas may have negative cumulative effects on fisheries which operate in year-round closures, including certain pot and trap fisheries.

Flexible Area Action System (FAAS) (Proposed action)

Eliminating or retaining the current FAAS will not have cumulative effects on communities, resources or habitat.

Leasing of DAS (Proposed action)

Days-at-sea leasing could have a negative affect on the resource. Total allocated DAS are higher than the desired level of used DAS; a leasing program may thus result in more DAS being used and increased effort could result in fishing mortality rates that exceed desired levels. DAS leasing remains subject to vessel upgrade restrictions, which will reduce opportunities for leases.. DAS leasing is intended to increase the functional value of days-at-sea by providing fishermen with more control over how they utilize these days. Leasing programs should have a positive effect on fishing communities. The overall cumulative effects of this program are likely to be negligible for the resource and habitat, and positive for individuals who choose to participate in the program.

Recreational Fishing Permit (Not selected)

Establishing a fishing permit for recreational fishers is not likely to have appreciable cumulative effects on the resource or habitat and may incur limited negative effects on the recreational sector, if permitting leads to additional costs. Improved data on recreational harvests may have positive, indirect cumulative effects on the resource in the long term.

Running Clock Alternatives (Not selected)

The running clock alternatives are unlikely to have cumulative effects on the resource and habitat. Option 1 (no action) will have no cumulative effects on communities. Option 2 (industry funded weighmaster) may be costly to fishermen but is unlikely to incur demonstrable cumulative effects on the industry and associated communities. Option 3 (extended modified running clock) will have positive impacts on fishermen who utilize the running clock, and may have low to moderate cumulative effects on this group.

<u>Observer Coverage (Proposed action)</u>
Options that increase the current level of observer coverage in the fishery may have indirect positive long-term cumulative effects on the resource, as improved data results in more accurate understanding of the fishery. Cumulative effects of observer coverage on communities and habitat are likely to be negligible.

<u>VMS Requirements (Proposed action)</u>
VMS is expensive for individual vessel owners due to the cost of purchasing, maintenance and energy requirements. Mandatory VMS is likely to have limited negative cumulative effects on the industry, particularly for vessels with high operating costs, or those fishing less frequently. VMS will have indirect positive cumulative effects on the resource, since it will improve enforcement of regulations and improve fishery-dependent data, providing more explicit information on spatial distribution of fishing effort. It is unlikely that VMS will have cumulative effects on habitat. Providing the ability to sign-out of the VMS program will reduce costs.

<u>Day Gillnet Block Out of Fishery (Not selected)</u>
Option 1, which retains the current restrictions on gillnet vessels, will not have cumulative effects on communities, resources or habitat. Options 2 and 3, which liberalize restrictions on gillnet vessels, may have small positive cumulative effects on the gillnet sector only, and non for other gear types. Options 2 and 3 may result in increased effort on some species harvested in gillnets but the negative cumulative effects of these measures are likely to be low.

<u>DAS Counting (Not selected)</u>
The options which eliminate partial days-at-sea (Options 2 and 3), are likely to have negative effects on data quality and may have indirect adverse effects on the fishery and resource. These options also reduce the value of days-at-sea, in effect, limiting the fishing that may take place within one DAS. Changes to the way DAS are counted may have a slightly negative cumulative effect on limited access multispecies vessels, and a very limited positive cumulative effect on the resource and habitat, due to a slight reduction in effort that results.

<u>Reporting Requirements (Proposed action)</u>
If VMS is required, cumulative effects on the communities, resources, or habitat will be similar to those discussed under VMS Requirements, above. The proposed action does not adopt a VMS requirement. The proposed action adopts electronic dealer reporting, links dealer and vessel reports through a trip identifier, and may eventually result in electonic vessel reporting. The impacts on the resource are likely to be positive as a result of improved information gathering, but not to any significant degree.

<u>Hand-Gear Only Permit Alternatives (Proposed action)</u>
These alternatives establish a hand-gear only permit, and are unlikely to have cumulative effects on the resource, communities or habitat. The proposed action limits hand-gear permits.

<u>Sector Allocation (General) (Proposed action)</u>
In general, sector allocation may be positive for fishermen, since it provides them with more control over specific management measures that will affect their fishing practices. It may lend flexibility to fishers and a greater sense of involvement in the regulatory process. Cumulative effects on fishing communities are, however, unknown at this time. Cumulative effects on the resource and habitat are negligible.

<u>Georges Bank Hook/Gillnet Sector Allocation (Proposed action, in part)</u>

Designed by stakeholders in the hook and gillnet gear sectors, this proposal is likely to have some positive cumulative effects for Georges Bank hook and gillnet vessels and their associated communities, although the extent of these benefits are unknown. The cumulative effects of this alternative on the resource are positive for Georges Bank cod for which a quota is established, and positive but low for other Georges Bank stocks due to the additional effort restrictions proposed. There are no cumulative effects on habitat. The Closed Area I access program associated with this alternative may have negative effects on Georges Bank haddock if participation in the sector is high. Although this alternative allows for access into Closed Area I, cumulative effects on habitat are negligible, since the hook and gillnet gear have limited contact with the bottom. The proposed action only adopts a hook gear sector.

Gulf of Maine Inshore Conservation and Management Stewardship Plan (Not selected)
The cumulative effects of this area management alternative are unknown for communities. They are likely to be positive for stocks and negligible to none for habitat.

5.7.7.2 Capacity Reduction Alternatives

Each of the capacity alternatives is designed to provide greater economic opportunity and flexibility for multispecies fisheries and, to some extent, open access scallop fisheries while maintaining the character of the existing fleet. In addition, they are intended to achieve some long-term reduction in the number of vessels permitted to fish in Northeast fisheries. The overall cumulative effects of capacity alternatives will be generally positive for participants in the capacity reduction program, and neutral for others. The way in which effective effort is defined in Alternative 5 may create some loss in allocated DAS for some individuals. Generally, permit holders who opt to transfer, acquire, or freeze permits are those who are likely to get a net economic benefit from doing so. Because these alternatives are intended to reduce effort in the long-term, their cumulative effects on the resource will likely be positive. Alternatives 1, 2, 3 and 4 are volunatry programs, making their impacts uncertain. Cumulative effects of Alternatives 5 and 6 on the resource are likely to be positive, since these options will reduce available DAS. Any of the alternatives will be more effecitve in controlling mortality if combined with Alternative 5 or another approach to reduce or control latent, unused DAS. If not, capacity reduction alternatives may increase effort in the short term, however, diminishing the positive value of their long-term cumulative effects. Cumulative effects on habitat are unknown, though most likely negligible unless effort is sharply reduced in regions of particularly sensitive habitat.

The impact of the Capacity Reduction alternatives, such as Permit Absorption, Permit Transfer, DAS Transfer and Freeze on Unused DAS, range from none to slightly positive due to the facts that these four are voluntary and may reduce latent effort, which would be beneficial to protected species. Since these measures are voluntary, no benefit will necessarily accrue if no one participates. The no action alternative assumes a generally negative impact due to little or no control of fleet size. The assumption is here that effects on protected species would be negative without any control on the fleet size. However, there would be a more positive effect when more permanent measures are adopted to recover large whales by reducing takings as the forthcoming Atlantic Large Whale Take Reduction Plan get developed and implemented. For the Permit Absorption alternative, the overall positive effect may be reduced for turtles if the permits that are transferred are combined with scallop permits, which may have negative additional consequences for sea turtles that are caught in scallop dredges. Similarly, the Permit Transfer alternative allows limited access permits holders to transfer to another vessel. This reactivation of latent effort which could result in changes in the gear used by a permit. If this results in a a shift from trawls to gillnets, it may further impact large whales, harbor porpoise, dolphin and seals. This is not a likely result, however, given the relative economic performance of these sectors in recent years – the change in gear is likely to be in the other direction. The net cumulative effects to these species is unknown. The same is true for DAS Transfer and Freeze on unused DAS. The remaining alternatives, DAS Reserve and Mandatory latent Effort, have mandatory controls on latent effort and therefore have offer more benefit to protected resources in comparison to the no action and the other alternatives and therefore have more positive cumulative effects.

The proposed action adopts the DAS transfer and the DAS reserve capacity options.

5.7.7.3 Management Alternatives to Address Rebuilding Requirements

Relative to the no action alternative, the most likely cumulative effects of the proposed action and four management alternatives to address rebuilding requirements are expected to be positive for the resource and its environment, negative in the short-term but positive in the long-term for the fishery participants, and are designed to create long-term sustainability of both the resource and the directed fishery. Cumulative effects of recreational measures are similar, but of a smaller magnitude.

Each of these rebuilding alternatives approaches the issue of stock rebuilding in a different way; all of the alternatives are designed to meet the goals of stock rebuilding. However, some of the rebuilding alternatives will only be successful in meeting the requirements of formal rebuilding programs for certain stocks when considered in a cumulative sense, in conjunction with other measures in Amendment 13 as well as previous and potential future measures. For example, Rebuilding Alternative 3 – Area Management – requires that hard TACs be implemented in conjunction with the measures outlined in this alternative to ensure its success. As a stand-alone alternative, area management has a positive effect on the groundfish stocks but does not meet the requirements of rebuilding programs for most of the stocks. The cumulative effects of area management in conjunction with additional effort controls that currently exist as well as future output controls (hard TACs) are strongly positive for groundfish stocks.

With respect to the four alternatives to rebuild the groundfish stocks and the proposed action, the impacts are all positive to protected resources in comparison to the no action. The no action here assumes that the existing closed areas are beneficia l to whales since they overlap with high use areas (Cashes Ledge, WGOM, and Right Whale critical habitat). Despite the negative effects of the threats discussed above, the existing closures are beneficial to large whales and other protected species. The 65 % reduction in used DAS, reduction in allocated DAS (with a hard TAC), Area Management (also with a hard TAC) and the Hard TAC alternatives all reduce the fishing mortality by reducing effort and gear in the water, thereby reducing potential for adverse effects to protected resources. It is unknown whether one of these alternatives would have a greater benefit to some or all the species. However, since there is a reduced effort and gear, there is likely less chance for gear entanglement by all species. Therefore, the four alternatives provide a net positive effect to protected species over and beyond the existing measures. This protection should further improve for large whales when the forthcoming Large Atlantic Whale Take Reduction plan goes into effect in the future.

The rebuilding alternatives in Amendment 13 employ many of the same types of measures. These basic management measures are discussed in terms of their cumulative effects, below.

<u>Area Closures (Year-round)</u>
Alternatives that incorporate measure:
Proposed action
NAA
Alternative 1
Alternative 2
Alternative 4
Alternative 3 not specified

All of the management measures to address rebuilding incorporate the current year-round area closures. Area closures alone are not likely to have significant effects on stock rebuilding, except for species of limited mobility, such as sea scallops. However, the effects of these closures over the long term are positive for the groundfish resource, since they protect areas of EFH for many of the stocks. There are no cumulative effects of year-round closures in the rebuilding alternatives in Amendment 13, since they are identical to the existing closures.

Seasonal/Rolling Closures
Alternatives that incorporate measure:
Proposed action
NAA
Alternative 1
Alternative 2
Alternative 4
Alternative 3 not specified

Like area closures, seasonal/rolling closures protect habitat and benefit groundfish stocks. These closures may, however, redirect effort, intensifying it in other areas. The cumulative effects of new seasonal and rolling closures are positive for the resource and habitat across the range of the fishery. The effects on communities may be negative and unequally distributed. Closures in the inshore Gulf of Maine may particularly impact smaller vessels, resulting in long-term negative cumulative effects on the inshore fleet.

Possession Limits
Alternatives that incorporate measure:
Proposed action
NAA
Alternative 1
Alternative 2
Alternative 3
Alternative 4

All of the rebuilding alternatives incorporate possession limits. If appropriate possession limits are chosen, they will have a positive cumulative effect on the resource. Possession limits may increase regulatory discards in some areas, although additional measures in Amendment 13 including special access programs and running the DAS clock, are intended to address this potential problem. Possession limits have no direct cumulative effects on habitat. They may have negative cumulative effects on fishers in the short-term, with long-term benefits resulting from successful stock rebuilding.

Effort Controls (Days-at-Sea)
Alternatives that incorporate measure:
Proposed action
NAA
Alternative 1
Alternative 2
Alternative 4

Most of the rebuilding alternatives utilize effort controls in the form of days-at-sea. Alternative 1 is the most restrictive in terms of DAS reductions, with a 65% decrease in active days across the fishery. DAS restrictions are among the most beneficial effort reduction tools, and result in a direct positive cumulative effect on the resource. By reducing the amount of time fishing gear is contacting the seafloor, DAS reductions also result in an indirect positive cumulative effect on habitat. The severe DAS reductions proposed in Alternative 1 will have a negative cumulative effect on communities, as vessels with too few days-at-sea to remain productive may be forced to retire from the fishery. The DAS leasing program and some of the capacity reduction alternatives are intended to alleviate some of the negative effects of DAS reductions.

Gear Restrictions

Alternatives that incorporate measure:
Proposed action
NAA
Alternative 1
Alternative 2
Alternative 4
Alternative 3 not specified

Gear restrictions are a component of nearly all of the rebuilding alternatives. Alternative 2, which uses gear modifications as primary tool for stock rebuilding, implements the most gear requirements and restrictions of any of the rebuilding alternatives. In general, increases in minimum mesh size, use of more selective gear to reduce the catch of incidental species and species of particular concern, net limits and other gear restrictions have a positive cumulative effect on the resource, particularly due to the protection of juveniles. Gear restrictions may have a positive cumulative effect on habitat if they reduce bottom contact time or introduce gear modifications that cause less damage to sensitive benthic structures. The cumulative effects of gear restrictions on communities are difficult to measure, although it is likely that these measures will have different effects across gear sectors.

Minimum Fish Sizes
Alternatives that incorporate measure:
Proposed action
NAA
Alternative 1
Alternative 2
Alternative 4
Alternative 3 not specified

Minimum fish sizes help protect juvenile fish, and have a positive cumulative effect on groundfish stocks. Establishing minimum sizes may have a greater impact on recreational fishers than those engaged in the commercial fishery, but the cumulative effects of minimum sizes in Amendment 13 are negligible. Minimum sizes have no cumulative effect on habitat.

VMS Requirements
Alternatives that incorporate measure:
Alternative 2
Alternative 4

The cumulative effects of VMS requirements are described under the fishery program administration section, above.

Long-term Cumulative Effects
Long-term effects of each of these rebuilding alternatives on the multispecies stocks are clear: stocks will rebuild as a result of the accumulated effects of measures applied over time and in response to these specific measures in Amendment 13 targeted at stock rebuilding. Effects of these alternatives in the long term are less clear or quantifiable from a social and economic perspective.

5.7.7.4 Alternatives to Minimize the Adverse Effects of Fishing on Habitat

5.7.7.4.1 Habitat Alternative 1, No Action Alternative – No Action

This alternative was not selected. This alternative retains management measures in place during fishing year 2001 that serve to protect habitat and minimize impacts associated with fishing. These include groundfish closed areas, effort controls, prohibition on the brush sweep or “streetsweeper” trawl, and the inshore Gulf of Maine 12 inch roller gear limit. In addition, for the purposes of this assessment, the No Action alternative includes the cumulative benefits of the other past management actions described in the previous section.

The three areas on Georges Bank and in southern New England were closed in December 1994 to trawls and dredges; the western GOM area was closed in May 1998. Shrimp trawls and clam dredges are exempted from the closed area regulations, and portions of the two closed areas on GB were opened to scallop dredging in June 2000. Because these closures are temporary and do not exclude all types of bottom-tending gear, they are not directly comparable to proposed habitat closed areas. As such, they do not benefit benthic habitat to the same degree as would permanent habitat closures that would exclude all gears that have a potential adverse effect on benthic habitat. These closures have, nevertheless, had a positive habitat effect during the past 4-8 years.

Fishing effort in the Northeast multi-species fishery has increased since the implementation of days-at-sea limitations in the fishery in 1995, but is well below levels that prevailed during the 1970s and 1980s. In contrast, bottom contact time in the scallop fishery has declined in recent years as the resource has grown and dredging has concentrated in areas with high biomass. Even if total bottom contact time has remained fairly stable in recent years, the displacement of effort from the closed areas has undoubtedly increased habitat disturbance in certain open areas, particularly in previously undisturbed or lightly disturbed areas. Restrictions on the use of "streetsweeper" trawls could have had beneficial effects on rocky bottom habitats in the GOM, although it is not clear that this type of gear was ever used to any great degree before it was prohibited.

The amount of bottom area included in the four existing groundfish closed areas is considerably more (5,847 nm^2) than in any of the habitat closed area alternatives, but they contain a smaller percentage of gravel substrate than alternatives 3, 4, and 6. Scaled for area, the percentage of EFH area for moderately and highly vulnerable species is relatively low. The predominant substrate is sand. Four of the five biomass indices (benthivores, amphipod feeders, principal groundfish, and principal demersal finfish) are high. The percentage of total biomass for six species with strong benthic habitat associations was moderate and the overall benthic biomass index was high.

5.7.7.4.2 Alternative 2 – Incidental Benefits of Stock Re-Building Measures

This alternative was selected. Proposed Amendment 13 management measures that are not directly habitat-related fall into eight categories. There are no habitat benefits, or no significant benefits, of fishery administration or sector allocation measures. Measures designed to control capacity (e.g., permit and days-at-sea transfers) will have long-term habitat benefits because they will limit the utilization of latent fishing effort that would otherwise increase effort. Days-at-sea (DAS) reductions that are implemented in Amendment 13 could be large (as much as 65% for certain stocks) and would reduce fishing effort and bottom contact time, as would possession limits – at least in certain areas and times of year. Rolling seasonal closures would only have temporary habitat benefits that would be lost as soon as fishing began again. Gear modifications that reduced gear contact with the bottom (e.g., raised footrope trawls) would have positive habitat benefits in areas where the gear is used. Habitat benefits that would result when certain areas are closed to fishing when a maximum catch (TAC) is reached would also be short-term and not very effective unless the area remained closed to all bottom-tending mobile gear for months at a time and/or the recovery time of benthic communities and seabed features was rapid. Measures that would allow unused DAS to be transferred to reduced impact gears would mitigate mobile gear effects.

Gear effects without any management measures are described as moderate to high. The implementation of fishery management measures have had incidental benefits as described above in the No Action alternative. The impact of any of the proposed Amendment 13 would add further benefits to offshore habitat. These benefits of the proposed alternatives are described in Section 5.3.6 of this document. The non-fishing impacts described above are generally considered in the low to moderate range in the offshore areas. The incremental effect of low non-fishing activities would not likely cause cumulative effects in these offshore fishing areas. The moderate level impacts that might occur would be localized in nature and therefore would not appreciably accumulate to enhance the negative effects of gear described above. Considering the incidental beneficial impacts of any of the above-described alternatives combined with the non-fishing and fishery management measures, the resultant effect will generally be a net positive effect on fish habitat in the offshore area. Since the effects of any of these alternatives do not occur in inshore or riverine areas, the beneficial effects would not accumulate in these areas. This would be true for negative effects, which also would not accumulate in these areas.

5.7.7.4.3 Alternative 3 – Modified Groundfish Closed Areas

This alternative was not selected. The proposed modifications to the boundaries of existing closed areas are intended to expand the area of complex hard-bottom habitat (gravel-cobble-boulder) and protect it from any adverse effects associated with fishing, particularly by mobile, bottom-tending gear (trawls and dredges). There are slight differences in the proposed western boundary of the western GOM closed area in the two versions of this alternative (3a and b). The area that would be closed is 2,727 (3a) or 2,637 nmi^2 (3b). These two alternatives rank high in terms of EFH area contained within the modified closed areas for 43 moderately and highly vulnerable species and life stages. More hard-bottom habitat (bedrock and gravel) would be protected than in any of the other six proposed closed are alternatives. The predominant substrates are sand and gravelly sand. Biomass indices for these two alternatives were high for benthivores, eleven principal groundfish species, and for six species that are closely associated with benthic habitats, and moderate for amphipod-feeding fish and a large group of demersal finfish species. The total benthic biomass index was high.

As with the previous alternative, the proposed modifications to the closed area boundaries under this alternative, combined with benefits of past manage measures, would have beneficial effects to EFH as a result of the additional hard-bottom protected areas. Thus, the negative effects of fishing offshore outside the closed areas would not accumulate and would be offset by the protection of the high quality hard-bottom areas. The slight difference in area between the two options would not result in any significantly different cumulative effects. No cumulative effects would occur in inshore/riverine areas as they are not affected by the closure.

5.7.7.4.4 Alternative 4 – Habitat Sub-Sets Within Modified Groundfish Closed Areas

This alternative was not selected. Areas within modified closed areas that would specifically protect hard-bottom habitats were selected. The area that would be closed is 2,241 nmi^2. This alternative ranks just as high as alternative 3 in terms of EFH area for 43 moderately and highly vulnerable species and life stages. This alternative ranked second to #3 (a or b) in terms of the percent bedrock and gravel it contains. The predominant substrates are sand and gravelly sand. The biomass indices for this alternative were the same as alternative #3, i.e., high for benthivores, eleven principal groundfish species, and six species that are closely associated with benthic habitats, moderate for amphipod-feeding fish and a large group of demersal finfish species. The total benthic biomass index was high.

As with the previous alternative, the proposed modifications to the closed area boundaries under this alternative, combined with benefits of past manage measures would have beneficial effects to EFH as a result of the additional hard-bottom protected areas. As with the previous alternative, the negative effects of fishing offshore outside the closed areas would be offset by the protection of the high quality hard-bottom areas. No cumulative effects would occur in inshore/riverine areas as they are not affected by the closure.

5.7.7.4.5 Alternative 5 – Closed Areas Designed to Balance EFH AREA Protection and Fishery Productivity

This alternative was not selected.

5a (2,870 nm^2) – Scaled for area, the five closed areas in this alternative contain a fairly high percentage of EFH area for 43 moderately and highly vulnerable species and life stages in the Northeast region. The percentage of gravel substrate is very low and there is no bedrock. The predominant substrates are sand and mud. Biomass indices for this alternative were low for benthivores and principal groundfish species, and moderate for amphipod-feeding fish, demersal finfish, and six species that are closely associated with benthic habitats. The total benthic biomass index was moderate.

5b (2,972 nm^2) – Scaled for area, the five closed areas in this alternative contain a fairly high percentage of EFH area for 43 moderately and highly vulnerable species and life stages in the Northeast region. The area of gravel substrate is very low and there is no bedrock. The predominant substrate is sand. Biomass indices for this alternative were high for moderate for demersal finfish, moderate for benthivores and amphipod-feeding fish, and low for principal groundfish species and six benthic species. The total biomass index is moderate.

5c (2,803 nm^2) – Scaled for area, the five closed areas in this alternative contain a high percentage of EFH area for 43 moderately and highly vulnerable species and life stages in the Northeast region. The percentage of gravel substrate is low and there is a very small amount of bedrock. The predominant substrates are sand and mud. Biomass indices for this alternative were low for principal groundfish species and moderate for benthivores, amphipod-feeding fish, demersal finfish species, and for six benthic species. The total benthic biomass index is moderate.

5d (2,918 nm^2) – Scaled for area, the five closed areas in this alternative would contain a relatively low percentage of EFH area for 43 moderately and highly vulnerable species and life stages in the Northeast region. The percentage of gravel substrate is low and there is no bedrock. The predominant substrate is sand. Biomass indices for this alternative were low for benthivores, amphipod-feeding fish, principal groundfish, and benthic species, and moderate demersal finfish. The total benthic biomass index was low.

The four closed area options (a-d) included in this alternative, combined with benefits of past manage measures, would have beneficial effects to EFH as a result of the additional protected areas. However, gains in the amount of hard-bottom habitat would be considerably less than alternatives 3 or 4. Furthermore, the biomass of species associated with the bottom would be less per unit area than in any of the other alternatives. Nevertheless, the negative effects of fishing in un-protected offshore areas would be offset by the five area closures proposed in any one of these alternatives. No cumulative effects would occur in inshore/riverine areas as they are not affected by the closures.

5.7.7.4.6 Alternative 6 – Existing Groundfish Closed Areas Except for Areas Opened Under Scallop FW13 Closed Area Access Program (No Modifications to Closed Area Boundaries)

This alternative was not selected. This is the largest of the proposed closed areas (4,038 nm^2). Scaled for area, the five closed areas in this alternative would contain a relatively low percentage of EFH area for 43 moderately and highly vulnerable species and life stages in the Northeast region. Some gravel substrate would be protected, but not as much as in the closed areas proposed in alternatives 3 and 4.. The predominant substrate is sand. Biomass indices for this alternative were high for benthivores, principal groundfish species, demersal finfish species, and for six species that are closely associated with benthic habitats, and moderate for amphipod-feeding fish. Total benthic biomass ranked high.

This closed area option would have beneficial cumulative effects to EFH as a result of closing such a large area that includes some hard-bottom substrate. As was the case for alternatives 3 and 4, this area supports a high biomass of benthic species, including 11 principal groundfish species. However, scaled for area, EFH gains would be slightly less than all the other alternatives except 5d. The negative effects of fishing in offshore areas that remained accessible to trawling would be offset by the protection afforded by the closed areas. No cumulative effects would occur in inshore/riverine areas as they are not affected by the closures.

5.7.7.4.7 Alternative 7 – Expand List of Gears Prohibited in Existing Closed Areas

This alternative was selected in part. This measure would exclude bottom-tending mobile gears such as shrimp trawls and hydraulic clam dredges from the existing groundfish closed areas. These gears are known to adversely effect benthic marine habitats, so there would be a positive habitat benefit associated with this alternative. This would probably not be the case for other gears that contact the bottom, but have negligible effects on benthic habitat (e.g., pots, gill nets, and long lines). The proposed action only applies this restriction to hydraulic clam dredges.

The cumulative effect for this alternative, combined with benefits of past manage measures, would be to reduce gear effects by prohibiting a more inclusive list of gear types within the existing closed areas that adversely affect benthic habitats. This would have a net benefit to habitat within these areas and no cumulative negative effects within the areas would occur. Since the areas are offshore, this alternative should have no cumulative effects to inshore and riverine areas.

5.7.7.4.8 Alternative 8 – Restrictions on the Use of Rockhopper and/or Roller Gear

This alternative was not selected. There are five options for this management measure. The first would involve an immediate prohibition on the use of roller gear with a diameter greater than the current maximum size (31-36 inches). This would be the least effective option, since it would allow large roller gear to be used: trawling would be more difficult only in areas with large rocks that the smaller diameter rollers could not get over. Options (b), (c), and (d) would prohibit the use of roller gear larger than 22, 12, and 5 inches, either immediately or in a stepwise fashion over several years. The smaller the maximum size, the greater the area that could potentially become inaccessible to trawling.

These restrictions would indirectly reduce trawling effort in rocky bottom areas, but probably not eliminate it completely. Reducing the size of rockhopper and roller gear increases the probability that the gear will hang up and be damaged, thus increasing the risks of trawling in rocky bottom areas and encouraging fishermen to avoid them.

The cumulative effect of this alternative, combined with benefits of past manage measures, would be to reduce trawling in rocky bottom areas that remain open to mobile bottom-tending gear. The benefits of this alternative would increase as the maximum size of the prohibited roller gear decreases. Habitat benefits would also be greater if any of these options were implemented immediately as opposed to being phased in over several years (as many as six years in 8(e)), and, more importantly, if they applied in a larger versus a smaller area. Because nearshore habitats have already been compromised by coastal pollution and habitat development, the beneficial effects of reducing trawling in rocky bottom areas may be limited by the physical disturbance that has already occurred in these areas. However, when trawl gear does hang up in rocky bottom, habitat damage may be more severe in local areas.

5.7.7.4.9 Alternative 9 – Require Vessel Monitoring Systems On All Groundfish Vessels

This alternative was not selected. Use of VMS on all groundfish vessels will improve the quality of data needed to determine the amount of fishing activity that takes place in certain areas and habitat types at certain times of year. This information will improve our understanding of habitat disturbance patterns in the NE region and facilitate future management decisions.

There are no cumulative effects negative or positive associated with this alternative since there is no associated impact. However, the information provided will enable fishery managers to better relate management actions to fishing effort and thus make more informed decisions on future habitat actions.

5.7.7.4.10 Alternative 10 – Habitat Closed Areas that are Modifications of Existing Mortality Closures and Other Proposed Habitat Closures *(Preferred Alternative)*

This alternative was selected, in part. Alternative 10b is part of the proposed action as a Level 3 habitat protection area. Alternative 10a is the second largest habitat alternative (3,050 nmi2). Additionally, both 10a and 10b have a very high percentage of overlap with the existing groundfish closed areas (82% and 81%, respectively). For this reason, the vast majority of bottom area contained within this alternative has been relatively un-disturbed by mobile, bottom-tending gear for 5-8 years. The areas are between 58-60% sand, but there is a modest amount of gravel and gravelly sand as well. While alternative 10a protects more habitat than 10b, the cumulative effects of both alternatives are positive for habitat.

5.7.8 Social and Economic Effects of Habitat Measures

This cumulative impact assessment characterizes the magnitude of social and economic impacts likely to result from the alternatives considered in the Draft Environmental Impact Statement for the Essential Fish Habitat Components of Amendment 13 to the Northeast Multispecies Fishery Management Plan.

5.7.8.1 Social and Economic Conditions of Communities and Businesses

General Revenue Loss Impacts

Alternative 5b level 1 will result in the most significant revenue losses nearing 38 million dollars. The revenue impacts of Alternatives 6, 10a and 10b, which approach 4 million dollars, are significantly less than all other alternatives and is 33 million less than the losses likely to be experienced under alternative 5b, the most restrictive. The smallest losses are expected for Alternative 10b.

Port Community and Regional Impacts

The concentration of revenue loss for Level 1 EFH alternatives 3a, 3b, and 4 are localized in the New Bedford, Gloucester, and Cape Cod regions with a minimum of approximately 2/3 of the revenue loss coming from the community of New Bedford. A level 3 closure generally reduces overall revenue losses across ports except for New Bedford for which revenue loss remains constant for both closure levels. This results in an increase in the relative proportion (> 80%) of impact for New Bedford for these alternatives. Smaller impacts were found for the communities of Gloucester followed by Harwichport, and Chatham which were generally lower for level 3 closures. This contrasts with alternatives 5a, 5b, 5c, 5d, 10a and 10b, for which smaller revenue losses were more evenly distributed across five regions (New Bedford, Gloucester, New Jersey, Cape Cod, and Boston).

<u>Surf Clam and Ocean Quahog Fishery</u>**:** Alternatives 3a, 3b and 4 would have no impact on the surf clam/ocean quahog fishery. Alternative 6 would mitigate impacts for the most states but would have the largest overall impact and would affect the state of Massachusetts exclusively. Of the Alternatives that would affect the fishery, Alternative 5a would have aggregate impacts similar to that of Alternatives 5b and 5d but these impacts would be more broadly distributed across states in the Northeast region.

State	Total Bushels	Alternative 3a, 3b, & 4	Alternative 5a	Alternative 5b	Alternative 5c	Alternative 5d	Alternative 6	Alternative 10A & 10B
MA	936,236	0	4.1%	11.0%	11.0%	8.8%	40.7%	4.8%
MD	622,065	0	5.1%	0.0%	5.1%	0.0%	0.0%	0.0%
ME	108,590	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NJ	3,788,123	0	2.4%	0.4%	2.4%	0.0%	0.0%	0.0%
RI	175,920	0	0.9%	0.9%	0.9%	44.6%	0.0%	2.1%
Totals	5,630,934	0	2.9%	2.1%	4.0%	2.9%	6.8%	0.9%

Table 362 - Proportional Loss of Surf Clam/Ocean Quahog Landings (bushels) by State and Alternative

Vessel leng th class
Alternative 5b has the greatest over-all impact across all vessel sectors for level 1 EFH closures ranging from income impacts of 10% for large and medium vessels to 23% for small vessels. Level 3 impacts remain the same for large vessels and fall below 10% for medium and small vessels. Alternative 6 has the least impact on revenue across all vessel categories, all of which are less than 3%. Revenue impacts for small and medium vessels are most affected by alternatives 5a - 5d while large vessels are more affected by alternatives 3a and 3b. Level 3 revenue impacts are generally lessened for medium and small vessels while large vessel impacts remain constant.

Number of affected vessels
The number of small vessels impacted is substantially less for a level 3 closure while the number of vessels impacted for large and medium vessel classes is not significantly different between level 1 and 3 closure alternatives. The number of boats affected and the average revenue loss of impacted vessels is greater for alternatives 5a, 5b, 5c, and 5d as compared to other alternatives.

Gear
The hook, gillnet, and trap gear sectors are consistently impacted across all alternatives for level one closures. These impacts are eliminated for level 3 closures. Scallop dredge and trawl gear sectors impacts remain the same for level 1 and level 3 closures.

5.7.8.2 Anticipated Revenue Losses for Habitat Alternatives Based on Input/Output Analysis

The impacts on gross sales, income and employment in the New England coastal would be greatest for Alternative 5b while either Alternative 6, 10A or 10B would reduce these impacts by nearly ten-fold. The impacts are likely to be an upper bound estimate since the potential impacts of Level 3 vis à vis Level 1 were not estimated. In between these extremes, the remaining alternatives form two clusters each having similar impacts within a cluster. Specifically, Alternatives 3a, 3b and 5c form one of these clusters with gross sales impacts of about $100 million; income losses of about $30 million; and employment losses of up to 1,400 jobs. Alternatives 4, 5a, and 5d form a second cluster with lower impacts of about $70 million in sales, $20 million in income losses, and losses of less than 1,000 jobs. Alternative 10b results in the lowest employment impact, with a loss of only 175 jobs.

Across sub-region the Massachusetts sub-regions of New Bedford, Gloucester, Cape and Islands, and Boston account for between 70 and 90% of economic impacts regardless of alternative. The New Bedford sub-region would be particularly affected followed by Gloucester and the Cape and Islands sub-region. For New Bedford the Level 3 habitat closure may not provide substantial relief because of the importance of scallops, monkfish, and groundfish in the New Bedford seafood economy.

5.7.8.3 Cumulative Effect on Communities and Businesses

In general, impacts across all forms of analysis identified habitat alternative 5b as having the greatest impact and alternatives 6, 10a, and 10b as having the least. In between these extremes, more severe impacts (gross sales impacts of about $100 million; income losses of about $30 million; and employment losses of up to 1,400 jobs) will result from alternatives 3a, 3b, and 5c. Less severe impacts (losses of about $70 million in sales, $20 million in income losses, and losses of less than 1,000 jobs) will result from alternatives 4, 5a, and 5d. The cumulative effects of habitat alternatives on communities are negative, and are evident in the predicted loss of income and jobs. Cumulative effects of alternatives 4, 5a, 5d, 10a and 10b will be less severe and long-lasting than those resulting from alternatives 5b, 5c, 3a, and 3b. Generally speaking, the amount of area closed to fishing does not predict the severity of cumulative effects of these closure measures on communities. Location and timing of closures are more important factors in determining how these alternatives will affect the fishery.

For all VTR records retained for analysis, the total estimated gross revenue from all species reported during calendar year 2001 was $296.3 million. For a Level 1 habitat closure the relative change in total gross revenues ranged from a low of 1.3% for Alternative 6 to a high of 12.8% for Alternative 5b. The remaining alternatives all ranged between 5 and 8% in total revenue impact with little appreciable difference between Alternatives 3a (7.8%) and 3b (7.4%) or between Alternatives 4 (5.3%) and 5d (5.6%).

Revenue impacts across species were more varied across alternatives than total revenue impacts. The impact on monkfish revenue was between 11 and 18% under any of the variants of Alternative 5 a-d. By contrast, scallop revenue impacts were largest under Alternative 5b (10.8%) but were less than 1.5% for Alternatives 5a, c, and d. Revenue losses for small mesh fisheries for whiting and squid were similar (about 3%) for Alternatives 5a, b, and c but were less than 1% for all others. Revenue losses for combined "other" species (dogfish, skates, lobster, shrimp, herring, mackerel, tunas, and clams) were greatest for Alternatives 5b (12.7%) and 5c (11.4%) but were similar all other habitat alternatives (from 3.5 to 6.5%). Revenue losses for groundfish were highest for Alternative 5b (21.6%) and lowest for Alternative 6 (1.7%). With only two exceptions revenue losses for groundfish exceeded that of all other species across all alternatives. Revenue losses for combined summer flounder, black sea bass, and scup were 0.1% for all alternatives other than the variants of Alternative 5. Among these alternatives, revenue losses were similar for Alternatives 5a, c, and d.

A Level 3 habitat closure would mitigate revenue impacts on stationary bottom tending gear, and as a result, total revenue impacts would be lessened. The revenue losses for a Level 3 closure ranged from 8.1% (Alternative 5b) to 0.5% (Alternative 6). Compared to the Level 1 closure effects, the revenue losses for the remaining alternatives were about 1 to 2% lower. However, revenue losses for specific species groups were substantially reduced. Since a large proportion of monkfish are landed with gillnet gear the Level 3 closure would mitigate a substantial proportion of estimated monkfish revenue losses. Similarly, revenue losses for the "other" species group would be mitigated under a Level 3 closure because a significant proportion of these revenues are comprised of lobster using trap gear. Revenue losses for groundfish would be partially offset by a Level 3 closure since gillnet and hook segments of the groundfish fishery would not be affected. However, trawl gear accounts for the majority of groundfish effort so groundfish revenue losses would still range between 9 and 14% for all alternatives except Alternative 6.

Overall, the relative difference between a Level 1 and Level 3 habitat closure mitigates about 22% of total revenue losses for Alternatives 3a, 3b, and 4. For the Alternative 5 variants the revenue losses are reduced by as much as 46% (Alternative 5c). Much of this reduction in revenue impact is associated with savings of monkfish gillnet and lobster trap fishery revenues.

As a share of total revenue loss, groundfish losses for a Level 1 closure range from a low of 27% for Alternative 6 to a high of 54% for Alternative 4. Revenue losses for scallops represent about one-quarter of revenues loss for Alternative 4 and nearly one-third of total losses for Alternatives 3a, 3b, and 5b. Monkfish revenue losses were 7% or less of total revenue losses for Alternatives 3a, 3b, and 4 but were at least 12% of revenue losses for all other alternatives.

Since a Level 3 habitat closure does not provide any relief to fisheries using mobile bottom-tending gear the share of revenue impact for fisheries that are dominated by these mobile gears increases relative to other fishery impacts. For example, the combined share of groundfish and scallop revenue losses is at least 70% for all Alternatives and is as much as 90% of revenue impact for Alternative 4.

5.7.8.4 Habitat Alternative Impacts on Protected Species

The Habitat alternatives also have a generally slightly positive to positive cumulative impact to protected resources in comparison to No Action. Again without the habitat alternatives, positive impacts to protected resources would result from the existing closed areas in the short term. However, the threats to large whales discussed above would likely continue until specific measures identified in the ongoing and future recovery plans and the forthcoming Atlantic Large Whale Take Reduction Plan are implemented through some future action or regulation, as appropriate. The overall cumulative effect of the rebuilding alternatives (Alternative 2) is considered positive to protected species, as discussed above. However, since the closures are made for fishery management purposes, they are subject to change by future management actions, for example, when the stocks are rebuilt. Closed area alternatives 3, 4, 5, 6 and 10 would be more permanent since they are for the purpose of habitat protection. Since the concern here is mobile bottom-tending gear such as trawls, the benefits to large whales, which will still interact with gillnets may be less positive for those species. Such closures would still reduce effort and gear in these areas and therefore reduce gear interaction with small mammals and turtles. Additional benefits would incur if habitat closures were chosen in addition to Alternative 2. Alternatives 2, 6 and 10 were identified as preferred alternatives. It is difficult to assess the impact of Alternative 7, since the gear that would be proposed for exclusion is not specified. Thus, the effects are unknown. It is not likely that Alternatives 8 (Restrictions on Rockhopper/roller gear) and Alternative 9 (VMS on all groundfish vessels) will have much positive effect and thus cumulative benefit to protected species. The latter may have positive indirect effects since it will provide accurate data on gear use and area identifying where effort is in relation to species distribution data. However, the overall cumulative effect would likely be negligible to none.

5.7.9 Other Foreseeable Local, State, and Federal Actions

While the measures to achieve rebuilding are expected to result in economic benefits to the industry over the long term, some effects of short term declines in revenues and jobs may be irreversible, restricting the economic growth of the industry during later years when the resource has been rebuilt. Two such effects are gentrification and delocalization. The process of gentrification transforms working harbors into upscale areas primed for recreation and tourism, replacing infrastructure that supports the commercial fishing industry with waterfront housing, entertainment and dining establishments, or other facilities. Among the businesses and industry support structures that may be eliminated are vessel maintenance and repair facilities, equipment manufacturers and retailers, fish processing plants, fish auctions, and provisioners of food, ice, fuel, oil, and other goods. As the industry is restricted in their ability to catch fish, the related land-based infrastructure is also constrained. With increasing shoreline property prices and an economically strained industry, this infrastructure may be permanently replaced by new entities with alternative functions. Hall-Arber et al. (2001) noted that "if the facilities as well as the stocks are not protected, once the biophysical capital rebounds, communities dependent on [these] facilities…will not be able to take advantage of the improved stock conditions to generate fisheries capital for the region and nation." These structural changes to the economy and physical composition of fishing communities are accompanied by delocalization, or the loss of localized community character and culture (Hall-Arber et al. 2001). Long-standing traditions and close-knit alliances that unite fishing communities and families may cease to exist.

Amendment 13 does not introduce measures that specifically seek to mitigate these problems of infrastructure loss and the changing culture of fishing communities in New England. This may have serious long-term economic and social effects. However, it can be assumed that if such reductions in land-based infrastructure are significant, the income, revenue and employment trajectories will be more depressed in later years than predicted by the quantitative economic analyses in this document. Hall-Arber et al. suggest that fishing community sites at greatest risk of gentrification and delocalization are those that are most "industrial" in appearance and closest to centers of urban activity, such as Gloucester and New Bedford.

Accompanying de-localization and gentrification is a change in the composition of fishery participants. Certain individuals who currently participate in the groundfish fishery may be forced to retire from fishing or move into another fishery. The implications of this are that long-term economic gains may not apply to current fishery participants if these individuals have left the groundfish fishery.

The impacts of possible future state and local community actions are difficult to evaluate, given the complexity and geographic range of the groundfish industry. In some communities, actions have been taken to preserve shoreline access for fishing businesses, through restrictions on use or through tax advantages. Such measures help slow gentrification and loss of the waterfront, helping to preserve infrastructure. Other communities have been less committed to maintaining a commercial fishing presence, and have encouraged increased use of waterfront property for tourist, recreational boating, or residential uses.

States have partnered with the federal government in the past to administer emergency relief to fishermen affected by restrictive groundfish regulations. State universities have initiated several programs to educate fishermen about options to groundfishing, including the use of fishing vessels to participate in scientific research projects funded by a variety of sources. In some cases, states have altered regulations for fishing in state waters to provide additional opportunities to fishermen coping with strict federal regulations. These direct interactions with the fishing industry are only one possible source of future impacts. State decisions on permitting of power plants, coastal wind farms, or other shoreside development could impact groundfishing in the future, though near-coast actions will have less impact on those groundfish species that do not rely on estuaries for a significant part of their life-cycle.

Reasonably foreseeable federal actions include additional or revised fishing regulations, both for the groundfish fleet and for other target species. Amendment 13 clearly contemplates adjustments in the future to make sure that target fishing mortalities are met, and provides room for special access programs if fishing mortality is too low. But many vessels depend on groundfish for only a portion of their fishing income. Revised regulations to cope with changing stock conditions for these other species could either positively or adversely impact fishing communities, depending on whether revenues increase or decline as a result. Any federal efforts to mitigate impacts of the regulations, such as through direct assistance to fishing vessels or through the funding of job retraining programs, etc., could mitigate some of the impacts of this action on communities. Federal support for an industry-funded buyout, if sufficient in magnitude, could help reduce the capacity of the groundfish fleet and improve the profitability of the industry. Some federal actions could have indirect effects. Federal decisions on offshore petroleum access, for example, could have either a positive or negative effect on the habitat and groundfish, and, as a result, the fishing communities dependent on those resources.

Fishery Program Administration Measures

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Fishing Year (Not selected)	(O)	(O) possible indirect benefits for bycatch reduction	(O)	(O)
• No Action				
• Calendar-based				
• Beginning in October				
• Beginning in July				
DAS Proration (Not selected)	(O)		(O)	(O)
• DAS Proration Option 1		slight (-)		
• DAS Proration Option 2		(O)		
• DAS Proration Option 3				
Periodic Adjustment Process	(O)	(O)	(O)	(O)
• No Action Alternative (Not selected)				
• Modified Periodic Adjustment Process (Proposed action)				
US/CA Resource Sharing Understanding (Proposed action)	(O)	(O)	(O)	(O)
Administration of Certified Bycatch/Exempted Fisheries (Proposed action)	slight (-) administrative costs	indirect (+)	(O)	(O)
Special Access Programs (SAP)	(+) provide increased harvesting opportunities/flexibility		(O)	(O)
• Georges Bank Yellowtail Flounder Special Access Program (Proposed action)		(-) for GB yellowtail fl. (O) other species		
• Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program (Proposed action)		(O)		
• U.S./CAN Resource Sharing Understanding SAP (Proposed action)		may be slightly (-) depending on specific measures chosen		

Table 363 - Summary of Impacts of Fishery Program Administration Measures

(+) = positive effect
(-) = negative effect
(O) = neutral or negligible effect

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Closed Area Administration	(O)			
• Rationale for Closed Areas (Proposed action)		(O)	(O)	(O)
• Access to Closed Areas (Not selected)		slight (-) Options 1-4 (+) Options 2,3,4 for non-target species (+) Option 5	(-) Options 1 & 2 for rt. whales (O) Options 3 & 4 (+) Option 5	possibly (-) Option 1 (O)Options 2,3,4 (+) Option 5
• Review of Year-Round Closed Areas (Not selected)		(O)	(O)	(O)
Flexible Area Action System (FAAS)	(O)	(O)	(O)	(O)
• No Action Alternative (Not selected)				
• Eliminate the FAAS (Proposed action)				
Leasing of DAS	(+)	(O) as long as total allocation is capped at appropriate level; may be (-) if not closely monitored	possibly (-) if effort increases in certain gear sectors	(O)
➢ Conservation Equivalency Alternatives				
• Option 1 – Leasing Within Categories (Not selected)				
• Option 2 – Calibrated DAS (Not selected)				
• Option 3 – Leasing Within Size Categories (Proposed action)				
➢ Limitations on Number of DAS Leased				
• Option 1 (Not selected)				
• Option 2 (Proposed action)				
➢ Permit History Provisions				
Recreational Fishing Permit (Not selected)	slight (-)	indirect (+)	(O)	(O)
• Option 1				
• Option 2				
• Option 3				
• Option 4				

Table 363 - Summary of Impacts of Fishery Program Administration Measures (cont.)

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
"Running Clock" Alternatives (Not selected)				
• Option 1 – No Action	(O)	(O)		
• Option 2 – Industry funded weighmaster	(-)	possible (+) convert regulatory discards to landings	(O)	(O)
• Option 3 – Extended modified running clock	(+)			
Observer Coverage				
• Option 1 – No Action (Not selected)			(O)	
• Option 2 – Observer Coverage Level Specified in Court Order (Not selected)	(O)	indirect (+)	(+)	(O)
• Option 3 – Observer Coverage Level Adjusted by NMFS (Proposed action)			(+)	
VMS Requirements (Proposed action)	(-)	indirect (+)	(O)	(O)
Day Gillnet Block Out of Fishery (Not selected)				
• Option 1	(O)			(+)
• Option 2	slight (+)	(O)	(O)	(O)
• Option 3	slight (+)			(O)
DAS Counting (Not selected)				
• Option 1 – No Action	(O)	(O)		(O)
• Option 2 – 15 hour minimum	(-)	slight (+) but indirect (-) due to diminished data quality	(O)	slight (+) reduced bottom contact time
• Option 3 – 24 hour DAS	(-)			
Reporting Requirements				

Table 363 - Summary of Impacts of Fishery Program Administration Measures (cont.)

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Dealer Reporting Options				
• Option 1 – No Action (Not selected)	(O)	(O)	(O)	(O)
• Option 2 – Trip Identifier (Not selected)	slight (-)	indirect (+)		
• Option 3 – Daily electronic reporting (Proposed action)	(-)			
• Option 4 – Daily electronic reporting, small dealer exception (not selected)	(-)			
Vessel Reporting Options				
• Option 1 – No Action (Not selected)	(0)	indirect (+)	(0)	(0)
• Option 2 – Trip Identifier w/ future electronic reporting (Proposed action)	slight (-)			
• Option 3 – VMS Action (Not selected)	(-)			
• Option 4 – VMS over 45 ft Action (Not selected)	(-)			
• Option 5 – Declaration into one fishing area Action (Not selected)	(--)			
• Option 6 – Call-in system modification (Proposed action)	slight (-)			
• Option 7 – Electronic reporting (Not selected)	(-)			
Hand-Gear Only Permit Alternatives	(O)	(O)	(O)	(O)
• Alternative 1 Action (Not selected)				
• Alternative 2 Action (Not selected)				
• Alternative 3 (Proposed action)				
• Category A – Limited Access				
o Option 1 (Not selected)				
o Option 2 (Proposed action)				
• Category B – Open Access				

Table 363 - Summary of Impacts of Fishery Program Administration Measures(cont.)

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Sector Allocation (general) (Proposed action)	(+) increased opportunity participate in regulatory process; provides autonomy to fishers	(O)	(O)	(O)
• Formation of a Sector				
• Sector Review and Approval				
o Option 1 – Streamlined Approval Process				
o Option 2 – Periodic Adjustment Process (Proposed tion)				
• Movement Between Sectors				
o Option 1				
o Option 2				
o Option 3 (Proposed action)				
• Allocation of Resources				
o Option 1				
o Option 2 (Proposed action)				
• Mortality/Conservation Controls				
• Enforcement of Sector Provisions/VMS Requirements				
• Interaction of Sector with Common Pool Vessels				
Georges Bank Hook/Gillnet Sector Allocation	(+) increased opportunity to participate in regulatory process; provides autonomy to GB cod hook and gillnet sectors	(+) gear restrictions, TACs, closed seasons	(O)	(O)
• Georges Bank Cod Hook Sector (Proposed action)				
• Georges Bank Cod Gillnet Sector (Not selected)				
• Hook/Gillnet Sector Georges Bank CA I Access Program		slight (-) for haddock		possible (-) for habitat in CA I
Gulf of Maine Inshore Conservation and Management Stewardship Plan Not selected)	(+) increased opportunity to participate in regulatory process; provides autonomy to GOM inshore fishers	(+) if implemented in conjunction with other measures	(O)	(O)

Table 363 - Summary of Impacts of Fishery Program Administration Measures(cont.)

Capacity Reduction Alternatives

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Past Actions	(-)	(++)	(+)	(+)
Amendment 13 Measures				
No action alternative (Not selected)	(O)	(O)	(O)	(O) unknown possible slight (+) in short-term if effort reduced; possible slight (-) if latent DAS reactivated
Alternative 1 - Permit Absorption (Not selected)	(+) for multispecies/scallop limited access multispecies permit holders only	Slgiht (+) most benefits with DAS reduction Option 4 and DAS reactivation Option 2	generally (O); may be (-) for turtles f much effort enters into scallop fishery	
• Option 1				
• Option 2a				
• Option 2b				
• Option 3				
• Option 4				

Table 364 - Summary of Impacts of Capacity Reduction Alternatives

(+) = positive effect
(-) = negative effect
(O) = neutral or negligible effect

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Alternative 2 – Permit Transfer (Not selected) • Option 1 • Option 2a • Option 2b • Option 3 • Option 4	(+)	Slight (+) but not as beneficial as Alternative 1	generally (O); may be (-) for large whales, harbor porpoise, & seals if effort moves substantially from trawls to gillnets	unknown possible slight (+) in short-term if effort reduced; possible slight (-) if latent DAS reactivated
Alternative 3 – DAS Transfer (Proposed action) • Option 1 • Option 2	(+)	Slight (+) Option 1 – (+) long term effort reduction Option 2 – less (+)	(O)	unknown possible slight (+) in short-term if effort reduced; possible slight (-) if latent DAS reactivated
Alternative 4 - Freeze on Unused DAS (Not selected) • Option 1 • Option 2	(+)	slight (+)	(O)	(O)
Alternative 5 - DAS Reserve (Proposed action)	(+)	(+)	(O)	(O)

Table 364 - Summary of Impacts of Capacity Reduction Alternatives(cont.)

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Alternative 6 - Mandatory latent effort categorization with voluntary flexibility options (Not selected)	(+)	(+)	(O)	(O)

Table 364 - Summary of Impacts of Capacity Reduction Alternatives(cont.)

Management Alternatives to Address Rebuilding Requirements

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Proposed Action • Reduction in allocated DAS and limits on use • Trip limit adjustments • Gear restrictions • Opportunity to target healthy stocks	(-) Greatest impacts on MA, ME, NH communities, vessels/communities most dependent on groundfish Impacts less than Alternative 1	(+) lowest mortality reduction benefit for white hake, witch flounder, plaice Combinatino of adaptive and phased strategy provide less benefit than constant mortality strategy	(+) less than Alternative 1, given opportunity to use Category B DAS	(+) effort redcution reducts bottom contact time.
No action alternative	(O)	(O)	(O)	(O)
Alternative 1 – Up to 65% reduction in used DAS (Not selected) • Option 1 – 55% reduction in used DAS • Option 2 – Phase-in of 65% DAS reduction	(-) Greatest DAS reductions Greatest impacts on MA, ME, NH vessels/communities, those most dependent on groundfish	(+) lowest mortality reduction benefit for white hake, witch flounder and Am. plaice	(+)	(+) effort reduction reduces bottom contact time
Alternative 2 – Reduction in allocated DAS/gear modifications (Not selected)	(-) greatest impacts on vessels most dependent on cod	(+) but hard TAC required to meet mortality reductions for nearly all stocks	slight (+) for whales, seals, harbor porpoise (O) for turtles	(+)
Alternative 3 – Area Management (Not selected)	Unknown, similar to alternative 4	(+) but substantially lower than required mortality reductions without hard TAC	(O)	unknown

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Alternative 4 – Hard TAC Alternative (Not selected)	(-) less negative impact than Alternatives 2 and 3 more favorable for small vessels least impact on small hook and gillnet vessels	(+)	(O)	unknown

Table 365 - Summary of Impacts of Measures to Address Rebuilding Requirements

(+) = positive effect
(-) = negative effect
(O) = neutral or negligible effect

Recreational Fishing Measures

Alternative Name	Effects on Communities	Effects on Groundfish Stocks	Effects on Protected Species	Effects on Habitat
Option 1 – FW 33 Settlement Agreement (Not selected)	(O)	(+)	(O)	(O)
Option 2 (Not selected)	slight (-)	(+) most beneficial	(O)	(O)
Option 3 (Proposed action	slight (-) least restrictive of 3 options	(+) least beneficial	(O)	(O)

Table 366 - Summary of Impacts of Recreational Fishing Measures

(+) = positive effect
(-) = negative effect
(O) = neutral or negligible effect

Cumulative Effects

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
• inshore	none	negative	Negative	negative
• offshore	none	negative		negative
Non-Fishing Entities and Actions (see Table 359)				
• inshore	chemical and biological – negative physical – positive, short-term; possibly negative long-term	negative, moderate		negative, moderate-high
• offshore		negative, low	Unknown	negative, low
Past Actions	short-term negative, high long-term positive, low	positive, moderate-high	Positive-low	positive, low
Reasonably Foreseeable Future Actions				
Local				
• Preserve industry waterfront access	positive	none	None	none
• Promotion of tourism, waterfront elopment	negative (fishing community)	positive	Cetaceans Negative-low	unknown
State				
• Coastal facility permitting decisions	unknown	unknown	Unknown	unknown
• Fishing industry support	positive	None	Negative-low	none
• University support for fishing industry earch	positive	positive	Unknown	positive
Federal				
Regulatory decisions for other fisheries	unknown	unknown	Unknown	unknown
• Direct industry support	positive	unknown	unknown	unknown
• Offshore permitting decisions	unknown	unknown	unknown	unknown
Amendment 13 - Fishery Program Administration Measures				
Fishing Year	none	none	none	none
• No action (selected)				
• Calendar-based				
• Beginning in October				
• Beginning in July				

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
DAS Proration (not selected)	none			none
•DAS Proration Option 1		negative, low	Unknown	
•DAS Proration Option 2		none	none	
Periodic Adjustment Process	none	none	none	none
•No Action Alternative (not selected)				
•Modified Periodic Adjustment Process				
US/CA Resource Sharing Understanding (selected)	negligible	none	none	none
Administration of Certified Bycatch/Exempted Fisheries (selected)	negligible (low administrative costs)	long-term positive, indirect	None	none
Special Access Programs (SAP) (selected)	positive, low			negligible
•Georges Bank Yellowtail Flounder Special Access Program		negligible	Negligible	
•Southern New England/Mid-Atlantic Winter Flounder Incidental Catch Program		negligible	Negligible	
•U.S./CAN Resource Sharing Understanding SAP		may be negative, low	Negligible	
•CAI hook gear CAP		Negligible	Negligible	
Closed Area Administration	none may be negative for certain fisheries, extent unknown			none
•Rationale for Closed Areas (selected)		none	none	
•Access to Closed Areas (not selected)		none for Options 1-4 positive, low for Option 5	Unknown-negligible	
•Review of Year-Round Closed Areas (not selected)		none	None	
Flexible Area Action System (FAAS)	none	none	None'	none
•No Action Alternative (not selected)				
•Eliminate the FAAS (selected)				

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
Leasing of DAS (selected)	positive, moderate for participantslow to negligible for others	none	Possibly Negative due to potentia increase	none
➢ Conservation Equivalency Alternatives			No cumulative effects if these me in effect; Otherwise, negative due increase in effort.	
•Option 1 – Leasing Within Categories				
•Option 2 – Calibrated DAS				
•Option 3 – Leasing Within Size Categories (selected)				
➢ Limitations on Number of DAS Leased				
• Option 1				
• Option 2 (selected)				
➢ Permit History Provisions				
Recreational Fishing Permit (not selected)	negative but negligible	long-term positive, indirect	none	none
• Option 1				
• Option 2				
• Option 3			None	
• Option 4				
"Running Clock" Alternatives		none	None	none
•Option 1 – No Action (selected)	none			
•Option 2 – Industry funded weighmaster	negative, low			
•Option 3 – Extended modified running clock	positive, low -moderate			
Observer Coverage	negligible	long-term positive, indirect		none
• Option 1 – No Action			Negligible	
• Option 2 – Observer Coverage Level Specified in Court Order			Positive-low	
• Option 3 – Observer Coverage Level Adjusted by NMFS (selected)				
VMS Requirements (selected)	negative, moderate	positive, indirect	None	none

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
Day Gillnet Block Out of Fishery				
Option 1	none	none	Positive-low	none
Option 2	positive, low (gillnet sector)	negative, low	Negative-low	
Option 3	positive, low (gillnet sector)		Negative	
DAS Counting				
Option 1 – No Action (selected)	none	none	Negligible	none
Option 2 – 15 hour minimum	negative, low	positive, low (effort reduction) negative, indirect (diminished data quality)	Negligible	positive, low
Option 3 – 24 hour DAS	negative, moderate		Positive-low	
Reporting Requirements	negative, slight to moderate	positive, indirect	none	none
Dealer Reporting Options				
• Option 1 – No Action				
• Option 2 – Trip Identifier				
•Option 3 – Daily electronic reporting (selected)				
•Option 4 – Daily electronic reporting, small dealer exception				
Vessel Reporting Options				
Option 1 – No Action				
Option 2 – Trip Identifier (selected)				
Option 3 – VMS				
Option 4 – VMS over 45 ft				
Option 5 – Declaration into one fishing area			none	
Option 6 – Call-in system modification				
Option 7 – Electronic reporting for all vessels				

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on	Cumulative Effects on
Hand-Gear Only Permit Alternatives	none	none	none	none
Alternative 1				
Alternative 2				
Alternative 3 (selected)				
Category A – Limited Access				
Option 1				
Option 2 (selected)				
Category B – Open Access				
Sector Allocation (general) (selected)	unknown	none		none
• Formation of a Sector			none	
• Sector Review and Approval				
Option 1 – Streamlined Approval Process				
Option 2 – Periodic Adjustment Process				
• Movement Between Sectors				
Option 1				
Option 2				
Option 3				
• Allocation of Resources				
Option 1				
Option 2				
• Mortality/Conservation Controls				
• Enforcement of Sector Provisions/VMS Requirements				
• Interaction of Sector with Common Pool Vessels				

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
Georges Bank Hook/Gillnet Sector Allocation	positive for hook/gillnet sectors, extent unknown	positive, low (Georges Bank)	unknown	none
• Georges Bank Cod Hook Sector (selected)				
• Georges Bank Cod Gillnet Sector (not selected)				
• Hook/Gillnet Sector Georges Bank CA I Access Program (not selected, but see above)		negative (for GB haddock), extent unknown	unknown	none
Gulf of Maine Inshore Conservation and Management Stewardship Plan (not selected)	unknown	positive, low	Unknown/positive if increase in observer coverage	none
Amendment 13 Measures- Capacity Reduction Alternatives				
No action alternative	Existing condition continue	none	Generally negative in short term with a more positive outcome pending the improvements implemented through recovery and take reduction plans improvements implemented through recovery and take reduction plans	Generally Negative except for closed areas where impacts are positive
Alternative 1 - Permit Absorption (not selected)	positive, low	Slight (+)	None – Slightly positive due to potential control of latent effort; May be negative for turtles if effort shifts to scallops	Positive-low
• Option 1				
• Option 2a				
• Option 2b				
• Option 3				
• Option 4				
Alternative 2 – Permit Transfer (not selected)	positive, low	Slight (+)	None – Slightly positive due to potential control of latent effort; May be negative for large whales, small cetaceans, seals and turtles if effort shifts from trawls to gillnets	Positive-low
• Option 1				
• Option 2a				
• Option 2b				
• Option 3				
• Option 4				

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
Alternative 3 – DAS Transfer (selected)	positive, low	Slight (+) Option 1 - long-term positive, Option 2 – positive, low	None – Slightly positive due to potential control of latent effort; May be negative for large whales, small cetaceans, seals and turtles if effort shifts from trawls to gillnets	Positive-low
• Option 1				
• Option 2				
Alternative 4 – Freeze on Unused DAS (not selected)	positive, low	Slight (+)	None – Slightly positive due to potential control of latent effort; May be negative for large whales, small cetaceans, seals and turtles if effort shifts from trawls to gillnets	none
• Option 1				
• Option 2				
Alternative 5 – DAS Reserve (selected)	Positive, moderate	(+)	Slightly positive to moderately positive due to mandatory control of latent effort	none
Alternative 6 – Mandatory latent effort categorization with voluntary flexibility options (not selected)	Positive, moderate	(+)	Slightly positive to moderately positive due to mandatory control of latent effort	none

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
Amendment 13 Measures - Management Alternatives to Address Rebuilding Requirements				
No action alternative	Positive, low. Landings and revenues expected to increase for many stocks, but not to same extent as for rebuilding alternatives.	Positive, low. Many stocks projected to increase in short term, but will not achieve rebuilding targets.	Generally positive in short term existing closures are coincident with important use areas; long term closures are uncertain since they are subject to fishery management actions	Negative
Proposed Action	negative, high	positive, high	Adds further benefits but degree is unknown	positive, moderate
Alternative 1 – Up to 65% reduction in used DAS (not selected)	negative, high	positive, high	Adds further benefits to No Action but degree is unknown	positive, moderate
•Option 1 – 55% reduction in used DAS				
•Option 2 – Phase-in of 65% DAS reduction				
Alternative 2 – Reduction in allocated DAS DAS/gear modifications (not selected)	negative, high	positive, high	Adds further benefits to No Action but degree is unknown	positive, moderate
Alternative 3 – Area Management (not selected)	unknown	positive, moderate		unknown
Alternative 4 – Hard TAC Alternative (not selected)	negative, high	positive, high		unknown

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
Amendment 13 Measures- Recreational Fishing Measures				
Option 1 – FW 33 Settlement Agreement	none	positive, low	none	none
Option 2	negative, low	positive, low		none
Option 3 (selected)	negative, low	positive, low		none
Amendment 13 – Alternatives to Minimize the Adverse Effects of Fishing on Habitat				
Alternative 1 - No Action	Existing Conditions Continue	Positive-low	Generally positive in short term existing closures are coincident with important use areas; long term closures are uncertain since they are subject to fishery management actions	Generally Negative except for closed areas where impacts are positive
Alternative 2 – Complementary benefits of other Amendment 13 Alternatives (Preferred Alternative) (selected)	negative	positive	Positive for all species; long term closures are uncertain since they are subject to fishery management actions	positive
Alternative 3 - Habitat closed areas	negative	positive	Positive for small mammals and turtles; only slightly positive for whales if gillnets are not excluded	positive, high
Alternative 3A				
Alternative 3B				
Alternative 4 – Habitat Subsets of Modified Groundfish Closed Areas	negative	positive	Positive for small mammals and turtles; only slightly positive for whales if gillnets are not excluded	positive, moderate-high

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Spe cies Species	Cumulative Effects on Habitat
Alternative 5 - Closed areas designed to protect EFH balance fishery productivity		positive	Positive for small mammals and t slightly positive for whales if gillne excluded	positive, moderate
• Alternative 5A – EFH/Productivity tradeoffs using group species EFH weights vs. scallop productivity a managed species productivity	negative			
• Alternative 5B – Total EFH value only using revised species EFH weights with no productivity tradeoff	negative, high			
• Alternative 5C – EFH/Productivity tradeoffs using revised species EFH weights vs. scallop productivity and other managed species productivity	negative			
• Alternative 5D – EFH/Productivity tradeoffs using revised species EFH weights vs. productivity by species for ea. individually				
Alternative 6 – Habitat Closures Consistent with the Framework 13 Scallop Closed Areas Access Program (Preferred Alternative)	negative, low	positive	Positive for small mammals and turtles; only slightly positive for whales if gillnets are not excluded	positive, moderate (but less than alternative 5)
Alternative 7 - Expand list of gears prohibited in closed areas (selected)	negative for prohibited gears none for others	positive, low	Unknown: Could be positive, negligible or negative depending upon type and level of gear displacement to areas where species occur	positive, moderate-low

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

Alternative Name	Cumulative Effects on Communities	Cumulative Effects on Groundfish Stocks	Cumulative Effects on Protected Species Species	Cumulative Effects on Habitat
Alternative 8 - Restrictions on the use of rockhopper roller gear	negative for rockhopper/roller none for others	positive, low	negligible	positive, moderate-low
• Habitat Alternative 8A				
• Habitat Alternative 8B				
• Habitat Alternative 8C				
• Habitat Alternative 8D				
• Habitat Alternative 8E				
Alternative 9 - VMS on all groundfish vessels	negative, moderate	positive, indirect	none	none
Alternative 10 - Habitat Closed Areas that are Modifications of Existing Mortality Closures and Other Proposed Habitat Closures (Preferred Alternative)	negative, low	positive	Positive for small mammals and turtles; only slightly positive for whales if gillnets are not excluded	positive, high
Alternative 10A	more impact than 10B			more beneficial than 10B
Alternative 10B (selected)	less impact than 10A			less beneficial than 10A

Table 367- Summary of Cumulative Effects of the Amendment 13 Proposed Action and Other Actions (cont.)

6.0 Data and Research Needs

In November, 2000 the Groundfish Oversight Committee identified the following research needs for the groundfish fishery and resource:

1. Investigations into stock definition, stock movements, mixing, and migration, such as through tagging studies, DNA markers, morphological characteristics, etc. Effect of assumptions on stock definition, movements, mixing, and migration on stock assessments.

2. Methods to improve sampling of commercial catch at age data, such as through cooperative NMFS/industry programs to supplement port agents.

3. Investigations into relationships between stocks, including predator/prey relationships and evaluation of whether stock status of some species is slowing rebuilding of groundfish stocks.

4. Comparative studies on the impacts (positive and negative) of gear on habitat, such as the different impacts between chain nets, roller gear, and rockhopper gear, etc. Studies on whether limiting roller or rockhopper gear, or specifying other aspects of trawl gear, results in areas of complex habitat that are not used by trawl fishermen.

5. Development of appropriate programs to collect information required for social and economic impact analysis.

6. Research on extent and composition of discards and bycatch in the groundfish fishery.

7. Research fishing practices or gear modifications that may change the ratio of component catch species or improve selectivity of gear. As an example, research should consider ways to catch flatfish and not roundfish, or ways to target haddock and not cod.

8. Research on bycatch and discards of groundfish in other fisheries, including small mesh fisheries, and fishing practices or gear modifications that may reduce bycatch or improve selectivity of gear.

9. Quantify the impacts of closed areas, and evaluate the effectiveness timing closures to coincide with spawning activity (e.g. Gulf of Maine rolling closures).

10. Development of industry–based information collection systems to improve information used for groundfish management.

Section 9.3.4 of the SEIS describes EFH research needs identified by the Habitat Technical Team.

7.0 Applicable Law

7.1 Magnuson-Stevens Act

The Magnuson-Stevens Act, implemented Oct 11, 1996, changed the standards for fisheries management. Perhaps the most significant of these changes is the establishment of strict criteria for determining the status of stocks based in large measures on maximum sustainable yield (MSY), and for rebuilding overfished stocks to biomass levels that can produce MSY on a continuing basis. This new requirement has taken several years to implement, primarily because the NEFMC has had to first revise all overfishing definitions to comply with the new standard, conduct assessments of all stocks to determine the status relative to the new overfishing definitions, and modify the management plans to achieve the stock rebuilding that is necessary.

7.1.1 Consistency with National Standards

Section 301 of the Magnuson-Stevens Act requires that regulations implementing any fishery management plan or amendment be consistent with the ten national standards listed below.

1. *Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.*

   The proposed management measures are designed to end overfishing on the eight groundfish stocks that are currently subject to excessive fishing pressure. In addition, the proposed action implements formal rebuilding programs for all overfished stocks. For overfished fisheries, the Magnuson-Stevens Act defines optimum yield as the amount of fish which provides for rebuilding to a level consistent with producing the maximum sustainable yield from the fishery. The measures are designed to achieve the fishing mortality rates, and yields, necessary to rebuild the overfished stocks.

   Because of the multispecies nature of this fishery, the measures necessary to rebuild overfished stocks also reduce fishing mortality on healthy stocks. This could prevent harvesting the opimtum yiled from those stocks while rebuilding programs are being followed for the overfished stocks. The proposed action includes measures that are designed to allow increased harvests of healthy stocks. These measures include the provision for special access programs to target healthy stocks, as well as the provision for additional fishing time, in the form of a different category of DAS, in order to target healthy stocks. While many of the details of these programs have yet to be developed, the proposed action etabslishes the structure that can be used to access healthy stocks in order that optimum yield can be harvested from them during the period that other stocks are being rebuilt.

2. *Conservation and management measures shall be based on the best scientific information available.*

   The proposed action is based on the most recent estimates of stock status available. These estimates are in the form of unpublished information provided by the Northeast Fisheries Science Center. Stock size and fishing mortality in calendar year 2002 was estimated based on landings information for that period. In addition, the amendment used information from the most recent stock assessments: either the updated assessments in November 2002 for the groundfish complex as a whole, or assessments published during 2003 for five stocks (witch flounder, SNE/MA yellowtail flounder, CC/GOM yellowtail flounder, SNE/MA winter flounder, and GOM winter flounder).

   Management targets for this action are based on NEFSC 2002a, a comprehensive review of fishing mortality thresholds and biomass targets for the groundfish complex.

With respect to bycatch information, the action uses bycatch information from the most recent assessments. Bycatch data from observer report , vessel logbooks, or other sources must be rigoroulsy reviewed before conclusions can be drawn on the extent and amount of bycatch. While additional observer data has been collected since the most recent assessments were completed, it has not been analyzed or reviewed through the stock assessment process and thus cannot be used.

The Gear Effects Evaluation and Adverse Impacts Determinations for the Final Environmental Impact Statement for the Essential Fish Habitat Components of Amendment 13 satisfy these requirements. The SFA requires the NEFMC to minimize, to the extent practicable, the adverse impacts of fishing on the EFH associated with any federally regulated fishing activities in the Northeast region. To do this, this amendment must evaluate the effects of all fishing gears used in the region on groundfish EFH, following the guidelines indicated above. The potential impacts of groundfish fishing on the EFH of other species in the region must be evaluated as well.

Since the implementation of the Council's Omnibus EFH Amendment of 1998 (NEFMC 1998), NMFS, NEFMC and MAFMC conducted a Gear Effects Workshop that evaluated the effects of fishing gears used in the Northeast region on mud, sand, and gravel habitats (NEREFHSC 2002). Additional sources of information include work done by the NEFMC Essential Fish Habitat Technical Team, and a National Research Council report on the Effects of Trawling and Dredging on Seafloor Habitat (NRC 2002). Additional information is included in this document.

Gear Descriptions
Specifically, to describe gears, information from the NMFS VTR database and an ASMFC gear report was used. The primary source of information for gear descriptions was the EFH Omnibus Amendment (1998). Additionally, gear descriptions are provided using the Northeast Regional EFH Steering Committee's 2002 report from the Gear Effects Workshop in addition to several articles published in peer reviewed journals.

Distribution of Fishing Activity by Gear
The data used to perform this analysis were extracted from vessel trip report and clam logbook databases maintained at the U.S. National Marine Fisheries Service (NMFS) Northeast (NE) Regional Office in Gloucester, MA. Days absent calculations for trawl and dredge vessels are clearly preferable to simply summing the number of trips, but over-estimate actual fishing time since they include travel time and any other non-fishing-related activity while vessels are away from port. Thus, the GIS plots and analyses presented here do not represent fishing effort. They were only used to indicate the relative, not the absolute, distribution of fishing activity by geographical area and sediment type. Toward this end, all GIS input data were compiled and sorted into three categories: low, medium, and high degrees of activity that corresponded to cumulative percentages of 90, 75, and 50% of the total number of days at sea, or days spent fishing for each gear type during the seven-year time period. Data reported from ten minute squares (TMS) south of Cape Hatteras, North Carolina (35° N) and north of 45° N latitude in the Gulf of Maine were excluded from analysis, as were TMS-binned data from the low end (cumulative percentages >90%) of the frequency distribution. Exclusion of "low end" data (TMS with only a few trips or days) eliminated a large number of spatially misreported trips from analysis. Also included in this section are GIS plots of fishing activity for scallop dredge vessels operating in the limited access fishery during 1998, 1999, and 2000 which were derived from vessel monitoring systems (VMS) placed aboard each vessel. These plots provide a much more detailed depiction of fishing activity for dredge vessels during these three years than VTR data since they are collected at much higher spatial and temporal resolutions. Data were collected at 20-minute intervals during the time when vessel speed was less than 5 knots in order to differentiate between fishing activity and steaming time and then binned into one nautical mile squares. It is recognized that fishing activity includes other activities besides dredging, e.g., shucking time.

Types of Gear Effects

A number of authors have reviewed, to varying extents, existing scientific literature on the effects of fishing on habitat (e.g., Auster et al. 1996, Cappo et al. 1998, Collie 1998, Jennings and Kaiser 1998, Rogers et al. 1998, Auster and Langton 1999, Hall 1999, Collie et al. 2000, Lindeboom and de Groot 2000, Barnette 2001, National Research Council 2002). The conclusions reached by these authors are extracted from a recent NOAA report (Johnson 2002). A number of review papers have focused specifically on the physical effects of bottom trawls (e.g. ICES 1973). A working committee of the International Council for the Exploration of the Seas (ICES) issued, in November 2000, a report on the "Effects of Different Types of Fisheries on North Sea and Irish Sea Benthic Ecosystems." This report (ICES 2000) was a summary of findings based on a comprehensive report of the same title edited by Lindeboom and de Groot (1998). Alteration of physical structure, sediment suspension, changes in chemistry, and changes to benthic community are documented and described in the FEIS using peer reviewed literature and two reports (NRC and Gear Effects Workshop).

A Review of Fishing Gear Effects Literature Relevant to the U.S. Northeast Region was conducted and included in the FEIS that included the review of forty-four publications. They included all known studies (written in English) that examined the effects of the three principal mobile, bottom-tending fishing gears used in the Northeast U.S. on benthic marine habitats. Only publications that evaluated the direct habitat effects of fishing by these gears were reviewed (i.e., modifications to the physical structure of the seafloor or effects on benthic organisms that live in or on the seafloor). Effects of fishing on resource populations were not included, nor were studies that evaluated the indirect effects of fishing on marine ecosystems caused by the selective removal of species targeted by the gear or which are caught incidentally (as by-catch) during fishing. Both peer-reviewed and non-peer-reviewed publications were included, but most were peer-reviewed. To be included, accounts of research projects had to be complete and describe methods and results. Abstracts and poster presentations were not included. The summaries in this document are, in all cases, based on primary source documents. Two bottom-tending mobile gear types that are widely used in other parts of the world, but not in the Northeast U.S. – beam trawls and toothed scallop dredges – were not included even though considerable research has been conducted on their habitat effects. Also excluded were studies done on the effects of other gear types used strictly in inshore state waters in habitats where sea scallops are not found (e.g., escalator dredges in submerged aquatic vegetation) and any research relating to fixed and pelagic gear effects.

Vulnerability of Benthic EFH to Bottom-Tending Fishing Gears and Adverse Impacts Determinations

To evaluate the vulnerability of benthic EFH to bottom-tending fishing gears, information used included: 1) the EFH designations adopted by the NEFMC and MAFMC; 2) the results of a fishing gear effects workshop convened in Fall 2001 (NEREFHSC 2002); 3) an evaluation of the information provided in this gear effects evaluation section of this document, including the effects of fishing gear on habitat from existing scientific studies, and the geographic distribution of fishing gear use in the Northeast Region; and 4) the habitats utilized by each species and life stage as indicated in their EFH designation and supplemented by other references. A matrix (was developed for each benthic life stage for each species to determine the vulnerability of its EFH to effects from bottom tending mobile gear. Six criteria were qualitatively evaluated for each life stage based upon existing information. Each evaluation consisted of a score based upon a predefined threshold. The methods used to rank vulnerability were subject to a peer review by the NMFS Northeast Fisheries Science Center's review process for publications. The thresholds for adverse impact determinations were developed and reviewed by the Council's Essential Fish Habitat Technical Team. The adverse impact determinations are based on conclusions in the Gear Effects Evaluation in section 09.3.1.2 and is substantiated by two recent reports. The first of these (NREFHSC 2002) is the report of a workshop held in October 2001 that examined the habitat effects of gears used in the Northeast region on three substrate types (gravel, sand, and mud). The second report (Morgan and Chuenpagdee 2003) evaluated the effects of ten different commercial fishing gears on marine ecosystems in U.S. waters.

Evaluation of the potential adverse effects of groundfish fishing on EFH
From the vulnerability analysis, it was determined that the EFH of some species in the region may be adversely impacted from groundfish fishing. Thus, alternatives were developed in Amendment 13 to minimize, to the extent practicable, the adverse impacts of groundfish fishing on EFH. Many of the alternatives designed to minimize the adverse impacts of fishing on EFH include closed areas for EFH protection. These alternatives were evaluated using a strategy developed by the Essential Fish Habitat Technical Team of the New England Fishery Management Council. Using the best available science for the entire region, the habitats within the management area were described. More specifically, the amount of various sediment types, the aerial extent of EFH designations, and biomass indices for various species were analyzed using several sources of data and methods (See Appendix XI for a detailed description of the methods used in the habitat evaluation). All of the data were analyzed using GIS, a mapping program that enables data to be analyzed geographically.

The sediments inside each alternative were evaluated based on a digitized US Geological Survey map (Poppe et al, published in 1986 and 1989), which is the only source of sediment data available that includes the entire management area. The amount and percent coverage of bedrock, gravel, gravelly sand, sand, muddy sand, and mud bottoms in each area was described. The amount and percent coverage of EFH area in square nautical miles was calculated for species with EFH vulnerable to bottom tending gear. EFH area was calculated as the number of square nautical miles included in designated ten-minute squares of longitude and latitude, as defined in the EFH Omnibus Amendment (1998) and other sources. Lastly, the Habitat Technical Team identified several trophic guilds, species assemblages, and individual benthic species that are indicators of the ecosystem characteristics of each proposed habitat closed area. Biomass data were obtained from the 1995-2001 NMFS bottom trawl survey data. As illustrated in the document, there are limitations to each of these data sets and methods, however the Council has used the best available science to describe the affected environment and evaluate the potential habitat impacts from the various alternatives under consideration.

3. *To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.*

The proposed action manages each individual groundfish stock as a unit throughout its range. In general, management measures specifically designed for one stock are applied to the entire range of the stock. There are minor exceptions, such as when a trip limit is applied to an area slighlty different than the stock area to facilitate management and enforcement concerns. In addition, the groundfish complex as a whole is managed in close coordination. Many of the management measures are applied to all groundfish stocks, They are desinged and evaluated for their impact on the fishery as a whole.

4. *Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.*

The proposed management measures do not discriminate between residents of different states. They are applied equally to all permit holders, regardless of homeport or location. While the measures do not discriminate between permit holders, they do have different impacts on different participants. This is because of the differences in the distribution of fish and the varying stock levels in the complex. For example, the measures designed to rebuild GB cod have more impacts on fishermen who target that stock. Some of these impacts may be localized, as often communities near the stock may have developed small boat fisheries that target it. These distributive impacts are difficult to avoid given the requirement to rebuild overfished stocks. Even if the measures are designed to treat all permit holders the same, the fact that fish stocks are not distributed evenly, and that individual vessels may target specific stocks, means that distirbutive impacts cannot be avoided.

The proposed action does include some measures designed to mitigate these distributive impacts. The sector allocation and special access programs are specifically designed to foster ways to target healthy stocks to mitigate some of these distributional impacts. In addition, the use of Category B DAS may create similar opportunities in the future, though many of the details of this program have yet to be defined.

The proposed action does allocate fishing priviliges under Amendment 13 based on a permit's fishing history during the period fishing years 1996 through 2001. Active groundfish fishermen during this period receive a higher percentage of their DAS that can be used when the amendment is implemented. The proposed action in effect reduces currently active groundfish effort while preventing inactive effort from re-entering the fishery until stocks rebuild. In the extreme, a vessel that was did not actively fish for groundfish during this period will not be able to fish at all when the amendment is implemented, though as stocks rebuild there may be opportunities provided in the future. The impacts of this measure for each state are described in section 5.4.9.4.5. The impacts are roughly similar for vessels that are homported in Maine, Massachusetts, Rhode Island, and New Hampshire. These impacts are greater for for vessels homeported in Connecticut, New York, New Jersey, and other states. This proposal, however, is reasonably calculated to promote conservation. By reducing active fishing activity, fishing mortality on groundfish stocks will be reduces and stocks will rebuild more quickly. At the same time, by controlling the opportunty for effort that has not been used to target grouindfsh in recent years, the proposed action prevents the reintroduction of new fishing effort that could slow stock growth.

One specific allocation of resources contained in the proposed action will occur through the sector allocation proposal. Allocations to a voluntary self-selecting sector will be based on the recent fishing history of the sector participants. The proposed action includes a limit so that a voluntary sector cannot acquire an excessive share of the TAC for any stock.

5. *Conservation and management measures shall, where practicable consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.*

The proposed management program relies primarily on restrictions in time fishing – days-at-ea (DAS) – to control fishing mortality. While there are measures included that tend to reduce economic efficiency of vessels, they are generally required for sound management reasons. For example, restrictions on minimum mesh size reduce catches, but benefit the resource by targeting larger fish that have had an opportunity to spawn. Closed areas also reduce efficiency by preventing fishermen from fishing in high cath areas, but provide benefits to both habitat protection and spawning aggregatioins of fish. Some of the measures in this amendment will improve economic efficiency. The increase in th GOM cod trip limit will make each day more profitable, and the reduction in the number of seasonal closures in the Gulf of Maine will enable fishermen more opportunities to fish in an economic manner. Specific proposals that address economic concerns include the DAS leasing and DAS transfer provisiosn of the amendment. These measures allow for fishermen to consolidate DAS on fewer vessels, making each active fishing vessel more economically viable.

6. *Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.*

The measures allow for the use of different gear, vessel size, and fishing practices. While there are many restrictions included with respect to minimum mesh size, quantity of gear, closed areas, and fishing time, there are no restrictions preventing the use of a specific gear in an open area, and few restrictions on the deployment of that gear. The proposed action includes programs desgined to encourage innovation in fishing practices in order to target healthy stocks. These programs include the special access programs, sector allocation, and the use of Cateogry B DAS.

7. *Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.*

   The Council considered the costs and benefits of a range of alternatives to achieve the goals and objectives of this FMP. It considered the costs to the industry of taking no action relative to adopting a rebuilding program. The expected benefits are greater in the long-term if stocks are rebuilt, though it is clear there are significant short-term declines in revenue that can be expected.

   Some management alternatives were not selected in part because of concerns over the costs and burdens of administering the program. The area management proposal, recreational fishing permits, periodic review of closed areas and certified bycatch/exempted fisheries, requirement for a vessel monitoring system on all vessels, flexible area action system – these are all examples of management measures whose costs were deemed to outweigh the benefits expected.

   The management program does not duplicate other regulatory efforts. Management of multispecies in federal waters is not subject to coordinate regulatoin by any other management body. Absent Council action, a coordinated rebuilding effort would not occur to restore the health of the overfished stocks.

8. *Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse impacts on such communities.*

   Consistent with the requirements of the Magnuson-Stevens Act to prevent overfishing and rebuild overfished stocks, the proposed action will restrict fishing activity through the imposition of additional restrictions on fishing time, possession limits, and other measures. In addition, it adopts additional measures intended to minimize, to the extent practicable, the adverse effects of fishing on essential fish habitat. Analyses of the impacts of these measures show that landings and revenues are likely to decline for many participants in th early years of the rebuilding program. These declines will probably have negative impacts on fishing communities throughout the region, but particularly on those ports that rel heavily on groundfish.

   The action, however, includes measures that are intended to both provide for sustained participation and minimze the adverse impacts of the measures. The proposed action is based on a combination of a phased and adaptive rebuilding strategies.Economic analyses of this approach shows that in the short term the economic impacts are less than under other approaches that were considered. Over the long term, the economic benefits may not be as great. The reason for choosing this approach was concern that the the other alternatives were so draconian that they would eliminate many ports from the fishery and as a result these ports would not be able to benefit when stocks rebuild. Both the strategy and the measures adopted are intended to provide for a higher level of sustained participation so that these ports will still be involved in the fishery when stocks rebuild.

   Other measures are included that are designed to foster continued participation. As previously discussed, the sector allocation, special access program, and Category B DAS programs are designed to provide avenues for fishermen to continue to participate while stocks rebuild. The proposed action reduces the number of seasonal closed areas in the Gulf of Maine (compared to FY 2001), reducing the periods when small boat fishermen from some ports are excluded from access to the fisheries.

9. *Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*

   The proposed action includes a number of measures that are designed to minimize bycatch. These are described in detail in section 5.2.8.

10. *Conservation and management measures shall, to the extent practicable, promote safety of human life at sea.*

   The primary control on fishing mortality use in this plan is limiations on the number of DAS that vessels can fish. These DAS can be used at any time, subject to limitations imposed by closed areas. Reductions in DAS could affect vessel safety if vessels are unable to remain economically viable. Comments received suggested that vessel maintenance and safety equipment are often two major costs that are trimmed when vessel revenues decline. In the early years of the rebuilding program, vessel revenues are expected to decline for many vessels under the proposed action. If operators are unable to afford maintenance or safety equipment, there could be an increased number of accidents. While reduced fishing time means that vessels are on the water for less time and subject to fewer hazards, it is not clear that this will compensate for the lack of spending on safety and maintenance equipement. Reduced time fishing could also lead to less experience for crew and vessel captains, which could adversely affect safety.

   The proposed action, however, does include some measures that may help mitigate these problems. Both DAS leasing and the DAS transfer provision will help some vessels obtain more DAS so that they can remain profitable. Indeed, public comments received highlighted that some owners who currently operate two vessels will be able to combine DAS on one vessel, saving some maintenance costs and enabling them to operate more safely. While DAS are being reduced, for some areas the action includes some measures to make each DAS more profitable. The GOM cod trip limit is raised to 800 pounds, for example. The proposed action also reduces the number of seasonal closed areas in the Gulf of Maine by two months, creating more opportunities for fishermen to choose to fish.

7.1.2 Other M-SFCMA requirements

Section 303 (a) of FCMA contains 14 required provisions for FMPs. These are discussed below. Any fishery management plan that is prepared by any Council, or by the Secretary, with respect to any fishery, shall—

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are-- (A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery; (B) described in this subsection or subsection (b), or both; and (C) consistent with the national standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law;

Optimum yield from this fishery is harvested entirely by U.S. vessels. There is no opportunity and no provisions for foreign fishing in this management plan.

(2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

An updated desription of the fishery is included in the Affected Human Environment section of the document, section 9.4.

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

Maximum sustainable yield is described in section 3.1.5, with a short explanation of the source of this estimate. Optimum yield continues to be defined as in Amendment 9 (see section 3.1.4). The condition of the fishery, including a summary of changes in stock status, is included in section 9.2.1.1, while information on landings and revenues form the fishery is in section 9.4. Probable future stock conditions are estimated in section 5.2.1.1. The future economic condition of the fishery is described in section 5.4.

(4) assess and specify-- (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3), (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing, and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;

Fishing vessels of the U.S. will harvest the optimum yield from th fishery and none will be available to foreign fishing.

(5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;

Reporting requirements are defined in section 3.4.14.

(6) consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery;

The proposed action continues to allow the carry-over of a small number of DAS from one fishing year to the next. If a fisherman is unable to fish because of weather or other ocean conditions, this measure allows his available fishing time to be used in the next fishing year. This practice does not require a consultation with the Coast Guard.

(7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat;

Essential fish habitat was defined in an earlier action. This amendment does not change those definitions.

(8) in the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;

Additional research needs are specified in sections and 6.0 and 9.3.4.

(9) include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on--(A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;

Fishery impacts are described in several sections. Economic impacts of the proposed measures to minimize the adverse impacts of fishing on essential fish habitat (to the extent practicable) are described in section 5.4.8. Other economic impacts, including the economic impacts of the meaures to achieve rebuilding requirements, are described in section 5.4. These impacts are described based on numerous categories, including homeport state and major groundfihs ports. Impacts of this action on other fisheries are described in section 5.4.13. Finally, section 5.6 analyzes the expected social impacts on a community/port level.

(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

The proposed action revises the criteria for identifying when a fishery is overfished. These revised criteria are described in section 3.1. By reference, the analysis of the criteria and the relationship to reproductive potential of a stock is detailed in NEFSC 2002a. The proposed action includes management measures (section 3.6) to end overfishing and rebuild overfished stocks identified in sections 3.2.1 and 3.2.3.1.3.

(11) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority--

(A) minimize bycatch; and

(B) minimize the mortality of bycatch which cannot be avoided;

Standardized reporting methodologies have been defined in previous actions for this management plan. They are modified by the proposed measures in section 3.4.14.2. In addition, the management plan includes guidance for an acceptable level of observer coverage (section 3.4.10) to supplement required vessel bycatch reporting. Conservation and management measures that, to the extent practicable, minimize bycatch and bycatch mortality are described in section 5.2.8.

(12) assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;

This management plan does not include any catch and release recreational management measures.

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors; and

Descriptions of the commercial, recreational, and charter fishing sectors which participate in the fishery, including trends in landings by these sectors, are in section 9.4.

(14) to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery.

Proposed management meaures restrict harvest levels for all sectors of the fishery. Recovery benefits have been allocated equitably, most notably with respect to haddck: commercial trip limits have been relaxed, and the proposed action removes the haddock bag limit for recreational vessels.

(15) The EFH Provisions of the SFA (50 CFR Part 600.815) require the inclusion of the following components of FMPs. The Council has fully met these obligations as detailed below each mandatory component.

(A) Identify and description of EFH
(B) Fishing activities that adversely affect EFH
  (i) Evaluation of potential adverse effects
  (ii) Minimizing adverse effects
(C) Identification of non-Magnuson-Stevens Act fishing activities that may adversely affect EFH
(D) Identification of non-fishing related activities that may adversely effect EFH.
(E) Cumulative impacts analysis
(F) Identification of conservation and enhancement actions.
(G) List the major prey species and discussion the location of the prey species' habitat
(H) Identification of habitat areas of particular concern
(I) Recommendations for research and information needs
(J) Review and revision of EFH components of FMPs.

(A) Identify and description of EFH
EFH for the management unit of the Northeast Multispecies FMP has been identified and described in Amendment 10. The Council plans to update these EFH designations through an omnibus amendment that will be initiated in early 2004 and will become Amendment 11 to the Northeast Multispecies FMP.

(B) Fishing activities that adversely affect EFH

(i) Evaluation of potential adverse effects

The EFH Final Rule (50 CFR Part 600) provides guidance to the Regional Fishery Management Councils for identifying fishing activities that adversely impact essential fish habitat (EFH). In addition to the EFH Final Rule, guidance provided by the Habitat Conservation Division (HCD) headquarters office in the form of a memo dated October 2002 was followed in the preparation of this section of Amendment 13. This evaluation should primarily include the impacts of activities associated with the fishery that is the subject of the management action, as well as other federally-managed and state-managed fishing activities. Based on the guidance provided by the EFH Final Rule and the HCD office, this determination focuses on the effects of fishing activities in the New England multi-species fishery on groundfish EFH. It also includes information on the effects of other federally-managed fishing activities on groundfish EFH, and identifies gears used in state-managed fisheries that could affect groundfish EFH. Most of the information needed to complete this determination is provided in more detail in previous sub-sections of Section 9.3.1.

Section 9.3.1.2 describes commercial fishing gears used in the Northeast region of the U.S. and the geographic distribution and use of the principal bottom-tending gears in three broadly-defined habitat types. It also evaluates the effects of bottom trawls and dredges on benthic marine habitats in the region. Most of this information is derived from the NMFS, NEFMC and MAFMC-sponsored Gear Effects Workshop that evaluated the effects of fishing gears used in the Northeast region on mud, sand, and gravel habitats (NREFHSC 2002) and from an extensive review of relevant gear effects studies (Stevenson et al. 2003). Additional sources of information include work done by the NEFMC Habitat Technical Team and NEFMC and NMFS staff, and a National Research Council report on the Effects of Trawling and Dredging on Seafloor Habitat (NRC 2002). The information in this section serves as the basis for evaluating which gear types, if any, are most likely to have an adverse impact on essential fish habitat for federally-managed species in the NE region.

Section 9.3.1.3 evaluates the vulnerability of all 37 federally-managed species' to gear types found to have potential adverse impacts on EFH. Vulnerability was evaluated according to four broad categories: none (0); low (L); moderate (M); and high (H), based upon a matrix analysis of habitat function, habitat sensitivity and gear use. Results are summarized by species and life stage.

Specifically, species and life stages were ranked according to the vulnerability of their EFH to the effects of mobile, bottom-tending gear. EFH for those ranked as moderately or highly vulnerable were included in this adverse impacts evaluation. For this determination, fishing activities are interpreted to mean fishing gears, since there is not enough information available to support a more detailed determination based on different fishing practices used with each gear type. Adverse impacts associated with each gear type are assessed for specific habitat types that make up groundfish EFH. Only benthic habitats are considered, since the gears used to catch groundfish are bottom-tending gears. Habitat type is based on type of substrate, and, to some extent, depth and degree of exposure to natural disturbance. These simplifications were made in order to allow maximum use of the information available and to provide an evaluation that encompasses as broad a range of the relevant fisheries and affected habitats as possible.

EFH for those ranked as moderately or highly vulnerable were included in this adverse impacts evaluation. For the purposes of this action, EFH vulnerability that is ranked as low is considered to have a potential adverse effect to EFH that is minimal and temporary in nature. Therefore, the Council will eliminate from further consideration any EFH that has a low vulnerability to scallop dredges, otter trawls and clam dredges. Refer to 9.3.1.6 for a detailed look at the vulnerability rankings based on shelter, food, reproduction, habitat sensitivity, habitat rank, gear distribution and gear rank. Background on how vulnerability was determined in this exercise is useful for understanding how EFH could be adversely affected as a result of fishing with different gear types. Vulnerability was divided into four broad categories, including: none (0); low (L); moderate (M); and high (H), based upon a matrix analysis of habitat function, habitat sensitivity and gear use. Several criteria were qualitatively evaluated for each life stage based upon existing information. Each evaluation consisted of a score based upon a predefined threshold. The criteria used and the key describing what each ranking stands for is described in 9.3.1.6. Depth range and substrates that are included in the EFH designations for those species that have been determined to be adversely impacted indicate that, as a group, they occupy a wide range of depths and bottom types.

Section 9.3.1.8 summarizes the results and findings of this section, identifying the potential adverse impacts of the three principal mobile, bottom-tending gears on three principal bottom types in the region. These results serve as the basis for analyzing proposed alternatives to minimize the adverse impacts of these gears on EFH.

(ii) Minimizing adverse effects

The EFH Final Rule also stipulates that "each FMP must minimize to the extent practicable the adverse effects of fishing on EFH that is designated under other federal FMPs". Federally-managed species that could be affected by the New England groundfish fishery are listed in 9.3.1.7. In order to minimize and mitigate the adverse effects of the fishery on EFH the Council will implement Habitat Alternative 2 (Benefits of other Amendment 13 alternatives), Alternative 7 (Expand the list of gears prohibited in year-round closed areas to include clam dredges), and Alternative 10b (Compromise Habitat Closure Areas). Habitat Alternative 10b will prohibit bottom-tending mobile gear, with the exception of shrimp trawls from the Western Gulf of Maine Closed Area, from fishing in vulnerable areas containing the above benthic habitat types. Alternative 7 will prohibit clam dredges from accessing groundfish closed. Additionally, Alternatives 2 will be implemented to further mitigate the adverse effects of the fishery on EFH. The proposed action is further described in Section 3.7 and the environmental consequences and practicability analysis of these alternatives can be found in Section 5.3.8, 5.3.9 and 5.3.10. The Council has determined that the combination of these gear restrictions, effort reductions and area closures minimizes, to the extent practicable, the adverse effects of fishing on EFH. This includes the adverse effects of the groundfish fishery on all federally-designated EFH as well as the adverse effects of other federally-managed fisheries on groundfish EFH.

(C) Identification of non-Magnuson-Stevens Act fishing activities that may adversely affect EFH
Section 9.3.1.9 addresses the requirement of this component. This section will be thoroughly updated in the upcoming omnibus habitat amendment (to be Amendment 14 to the NE Multispecies FMP).

(D) Identification of non-fishing related activities that may adversely effect EFH.
Section 9.3.1.10 addresses the requirements of this component. This section will be thoroughly updated in the upcoming omnibus habitat amendment (to be Amendment 14 to the NE Multispecies FMP).

(E) Cumulative impacts analysis
Section 5.7.7.4 addresses the requirement of this component.

(F) Identification of conservation and enhancement actions.
Section 9.3.2 addresses the requirement of this component. This section will be thoroughly updated in the upcoming omnibus habitat amendment (to be Amendment 14 to the NE Multispecies FMP).

(G) List the major prey species and discussion the location of the prey species' habitat
Section 9.3.3 addresses the requirement of this component. This section will be thoroughly updated in the upcoming omnibus habitat amendment (to be Amendment 14 to the NE Multispecies FMP).

(H) Identification of habitat areas of particular concern
Section 9.3.5 addresses the requirement of this component. This section will be thoroughly updated in the upcoming omnibus habitat amendment (to be Amendment 14 to the NE Multispecies FMP).

(I) Recommendations for research and information needs
Section 9.3.4 addresses the requirement of this component. This section will be thoroughly updated in the upcoming omnibus habitat amendment (to be Amendment 14 to the NE Multispecies FMP).

(J) Review and revision of EFH components of FMPs.
Section 9.3.6 addresses the requirement of this component. This section will be thoroughly updated in the upcoming omnibus habitat amendment (to be Amendment 14 to the NE Multispecies FMP).

7.2 National Environmental Policy Act (NEPA)

7.2.1 Executive Summary

See page I-iii.

7.2.2 Background and Purpose

The background and purpose for this action, including a statement of the problem , purpose and need for action, and goals and objectives are in Section 2.0. The problem and need for action were initially defined during the Council's scoping process. A summary of this process and the comments received during that time follows.

During the spring of 1999 the Council initiated a scoping process to solicit suggestions and information on the range of issues that should be addressed and alternatives that should be considered in Amendment 13. A list of issues were generated through scoping and additional meetings of the groundfish committee and advisory panel. These are summarized below.

Multispecies Stock Rebuilding

- The multispecies FMP must address the SFA requirement for maximum ten-year rebuilding schedules for all groundfish stocks.
- The fishery management cycle is not coordinated well with stock assessment cycle.
- Management measures to rebuild weaker stocks in a geographical region often preclude fishing for stronger stocks, resulting in more significant economic dislocation for the fleet as a whole.

Fishing Effort and Capacity

Latent effort

- With the current number of active vessels, allocated DAS cannot be increased without jeopardizing stock rebuilding.
- Only about 1/3 of the allocated multispecies DAS were used during the 1998 fishing year. Unused allocations could be re-activated, countering rebuilding efforts whenever catch rates increase. This demonstrates the challenge of matching groundfish fleet capacity to sustainable harvest capacity.

Days At Sea (DAS) effort reduction program

- DAS are not being used as the primary management tool to reduce fishing effort in the multispecies fishery because of very strong resistance to reducing DAS below current levels.

Inequities associated with DAS allocations and DAS usage

- Dayboats can make more than one trip per 24-hour DAS.
- "Catchability" (catch rates) of gear is difficult to coordinate with fishing effort/DAS allocations between gear sectors (For example, DAS are not counted for gillnet soak time.)

DAS "running clock"

- Both "frontloading" (beginning the DAS clock before leaving the dock) and running the clock after landing an overage decrease the ability to estimate true fishing effort through DAS usage.
- The "running clock" renders trip limits virtually unenforceable.

Allocation and Equity Issues

- Equal application of a regulation often results in unequal distribution of impacts on different fleet sectors.
- Conversely, application of different regulations to various fleet sectors is often perceived as an unfair allocation of fishing privileges.
- Management measures are often tied to specific gear sectors, yet there are no harvest allocations for any gear sectors.
- There is a significant perception of inequity due to exemptions/exceptions made for recreational vessels regarding trip limits and closed areas.

Closed Area Management

- It is very difficult to spread the conservation burden evenly across fleet sectors using area closures as a management tool.
- It is difficult to make closed areas less polarizing and less economically disruptive.
- Problems minimizing socio-economic impacts on communities are most directly affected by area closures

- Closed areas force vessels to concentrate their effort and fish less efficiently in remaining open areas, intensifying competition and increasing gear conflicts.
- Short-term area closures may not achieve intended results as areas open and effort re-enters the area.
- It is difficult to identify appropriate exemptions within the closed areas to minimize negative impacts on other fisheries.

Trip Limits

- When used as a primary mortality reduction tool (as they have been), they often result in significant discards and do not reduce fishing mortality as intended.
- Species-specific trip limits in a multispecies fishery often result in discarding of that species above the trip limit as vessels continue to fish for other multispecies.
- It is difficult to design a trip limit that adequately constrains both small and large vessels without inequitably affecting one or the other.
- “Backstops” often create incentive for derby-style fishing.
- In general, trip limits are very difficult to enforce.

Experimental and Exempted Fisheries

- Experimental and exempted fisheries are required to demonstrate that 5% or less of their catch is composed of non-target species. This five percent standard will become increasingly difficult to meet as groundfish stocks recover and may preclude several fisheries, offering few alternatives to fishing for multispecies even though regulated species bycatch may not be as important a concern as the stocks rebuild.
- The process for obtaining an exempted experimental fishing permit difficult and time-consuming.
- The challenges of this process provide no mechanism for encouraging conservation engineering.

Fishing Gear and Selectivity

- The multispecies FMP does not provide incentives for fishermen to use more selective, less destructive fishing gear (except for large-mesh exemptions).
- No mechanism exists in the multispecies plan for improving accountability for discarded bycatch.
- It is difficult to match minimum fish sizes with the appropriate minimum mesh size.
- There is a lack of adequate mesh/gear selectivity information for all multispecies stocks/fisheries.

7.2.3 Summary of the SEIS

Refer to Executive Summary, page I-iii.

7.2.4 Description of the Proposed Management Measures

The management measures under consideration are described in section 3.0. Descriptions of the measures not selected are in section 4.0.

7.2.5 Description of the Affected Environment

The Affected Environment is described in Volume II.

7.2.6 Impacts of the Management Measures Under Consideration

The impacts of the alternatives under consideration are described in section 5.0.

7.2.7 Cumulative Impacts of the Proposed Action

The National Environmental Policy Act (NEPA) requires that cumulative effects of “past, present, and reasonably foreseeable future actions” (40 CFR § 1508.7) be evaluated along with the direct effects and indirect effects of each proposed alternative. Cumulative impacts result from the combined effect of the proposed action's impacts and the impacts of other past, present, and reasonably foreseeable future actions. These impacts can result from individually minor but collectively significant actions taking place over a period of time. The Council on Environmental Quality (CEQ) directs federal agencies to determine the significance of cumulative effects by comparing likely changes to the environmental baseline. On a more practical note, the CEQ (1997) states that the range of alternatives considered must include the "no-action alternative as a baseline against which to evaluate cumulative effects." Therefore, the analyses in this document, referenced in the following cumulative impacts discussion, compare the likely effects of the proposed actions to the effects of the no-action alternative.

Cumulative effects are evaluated in section 5.7.

7.2.8 Determination of Significance

Section 6.02 of the NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act, provides specific guidance on determining the significance of fishery management actions. The nine criteria to be addressed are as follows:

1. May the proposed action be reasonably expected to jeopardize the sustainability of any target species that may be affected by the action?
2. May the proposed action be reasonably expected to jeopardize the sustainability of any non-target species?
3. May the proposed action be reasonably expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?
4. May the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?
5. May the proposed action be reasonably expected to adversely affect endangered or threatened species, marine mammals, or critical habitats of these species?
6. May the proposed action be reasonably expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?
7. May the proposed action be reasonably expected to have a substantial impact on biodiversity and ecosystem function within the affected area?
8. Are significant social or economic impacts interrelated with significant natural or physical environmental effects?
9. What is the degree to which the effects on the quality of the human environment are likely to be highly controversial?

The Council has reviewed the nine criteria relative to the action proposed in Amendment 13 to the Multispecies FMP. Based on these criteria the Council has determined that the proposed action represents a significant action and has prepared an EIS in accordance with the National Environmental Policy Act.

7.2.9 Response to Comments

Approximately 5,000 written comments were received during the comment period. Responses to comments are in Appendix XVII.

7.2.10 Rationale for the Proposed Action

Because of current stock status and the requirements of the Magnuson-Stevens Act, additional management measures are needed for the multispecies fishery to end overfishing and rebuild overfished stocks. These measures must comply with the specific requirements of the M-S Act as well as other applicable law. The Council believes the proposed management action is the appropriate way to meet these requirements. In order end to overfishing and rebuild overfished stocks, this amendment proposes extensive restrictions on the commercial and recreational fishing industries. For the commercial industry, the measures rely almost entirely on the use of effort controls to reduce fishing mortality. Effort controls – restrictions on the number of days that can be fished, requirements to use specific gear, closed areas, etc. – have proven successful in managing this fishery in the recent past. Fishing mortality has been reduced on a number of stocks in the multispecies fishery, and overall stock status has improved (see section 9.2.1.1 for specific details). In 1996, seventeen stocks were overfished; in 2002, only ten stocks are overfished, and five of those are projected to leave that status in the near future. Clearly recent experience shows that the use of effort controls can achieve reductions in fishing mortality if correctly designed and applied. These accomplishments are even greater if measures against the standards that guided previous management decisions rather than the recently updated esimates of target stock size. At the same time, however, it is clear that the application of these effort controls has not succeeded in meeting the stringent requirements of the M-S Act to end overfishing and rebuild overfished stocks. While many groundfish stocks are growing, there are still eight stocks subject to overfishing and roughly half the stocks are in an overfished status (many are expected to grow out of the overfished status in short order). Rather than abandon the use of effort controls, the Council has chosen a management program which will make them more stringent in order to address these problematic stocks.

The Council did consider three management alternatives that were based, at least in part, on quota or "hard" total allowable catches (TACs). These alternatives were not selected for a variety of reasons. A common element, however, is a hesitancy to replace a successful management program – effort controls - with a system that was tried in the early 1980's and failed miserably by both biological and economic measures. The application of a hard TAC in the multispecies fishery, with stocks that have overlapping geographic ranges, proved impossible to administer and enforce. Preliminary attempts to craft a hard TAC program based on directed and incidental fisheries proved impossible given the mix of species, gear, and seasons used to prosecute the groundfish fishery in New England. Experience in other regions has been similar when there has been a "global" quota – that is, one that is not allocated to individual vessels. Market disruption often occurs, as vessesl participate in a race to fish in order to harvest their share of the resource before the full quota is caught.

The use of effort controls, however, is not without problems. Effort controls tend to be blunt instruments, reducing mortality on both healthy and ailing stocks at the same time. Yield is sacrificed from healthy stocks in order to reduce mortality on stocks in poor condition. Reductions in days-at-sea, the primary control, reduce opportunities to fish on healthy stocks. For this reason, the proposed commerial fishery measures identify specific opportunities that can be used to target those healthy stocks. While some of the details of these programs remain to be specified, this proposal will both help mitigate the economic impacts of the proposed action and help realize the benefits of stocks that are rebuilding.

While over the long-term the expected benefits of the rebuilding program are positive, in the short-term harvesters are likely to experience reduced revenues. In addition to the opportunities that may be available to target healthy stocks, the proposed action includes measures to help the industry adapt to these short-term reductions and remain economically viable. By allowing vessels to lease fishing time, vessels that do not have enough time to fish can either lease their limited days to other vessels – earning revenues at reduced cost – or they can lease days from other vessels to make up for the shortfall. Either choice wil help improve the profitability of the fishery. Another program allows a vessel leaving all fisheries to transfer fishing time to another permit, subject to a conservation "tax" on fishing time so that the overall pool of allocated time is reduced.

The use of effort controls has also been complicated by the allocation of excessive effort to the industry as a whole. In recent years, the amount of time spent fishing has increased, but still was only a fraction of the allocated days available. In this action the Council has chosen to reduce the pool of allocated days that can be used by basing allocations on recent fishing history. This choice is controversial, but is intended to help current participants remain economically viable during rebuildng by limiting the amount of effort that can re-enter the fishery.

Other opportunities have been created to ensure a viable fishing industry. The proposed action will allow the formation of volunatry, self-selecting sectors. These sectors may be able to develop more efficient means to harvest their portion of the resource. Permit provisiosn for hand-gear permits have also been revised so that this small group of fishermen remain economically viable and continue to participate in the fishery.

While much of this discussion focuses on the need to end overfishing and rebuild overfished stocks, the proposed action also addresses other M-S Act requirements. The Council has selected alternatives that will minimize, to the extent practicable, the adverse effects of fishing on essential fish habitat. The selection of these alternatives is complicated by the nascent state of knowledge of the sea floor and the impacts fishing gear on habitat and fisheries production. The Council has carefully balanced these concerns and chosen alternatives that minimize the adverse effects of fishing while providing opportunties for the fishery to remain viable.

7.2.11 List of Preparers

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Dr. David Stevenson, NMFS NERO
Dr. Eric Thunberg, NMFS NEFSC
Dave Tomey, NMFS NERO
Dr. John Walden, NMFS NEFSC
Tom Warren, NMFS NERO

This Amendment and SEIS were prepared without any federal/state/local cooperating agencies as defined by 40 CFR 1501.6. Federal agencies represented on the New England Fishery Management Council include the U.S. Coast Guard and the U.S. Fish and Wildlife Service. State agencies represented on the Council include the fisheries management divisions of the states of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut.

7.2.12 List of Persons Receiving Copies of the DSEIS

The Council distributes the Draft FMP/DSEIS to members of the Groundfish PDT and the Groundfish Advisory Panel, and the Recreational Advisory Panel. These individuals include:

Tom Nies, Lori Steele, Leslie-Ann McGee, Anne Beaudreau, Deirdre Valentine, Chad Demarest, NEFMC Staff
Thomas Warren and Susan Murphy, NMFS Northeast Regional Office
Jon Brodziak, NEFSC (Population Dynamics)
Phil Logan, Eric Thunberg, John Walden, and Lisa Colburn, NEFSC Social Sciences
Steve Correia, Massachusetts Division of Marine Fisheries
Kevin Kelly, Maine Department of Marine Resources
Vincent Balzano, Saco, ME
Carl Bouchard; Exeter, NH
Joseph Branin, Highlands, NJ
Sima Freierman, Montauk, NY
Randy Gauron, Hampton, NH
Willam Gerencer, Bowdoin, ME
David Marciano, Beverly, MA
Frank Mirarchi, Scituate, MA
Paul Parker, No. Chatham, MA
Geoffrey Smith, South Portland, ME
Bud Brown, Georgetown, ME
Charles Cassels, Georgetown MA
Frederick Christian, Salem, MA
Bradley Cook, Hampton, NH
Philip Desfosses, Portsmouth, NH
Anthony Dilernia, Fresh Meadows, NY
Barry Gibson, Beverly, MA
Joseph Grady, Hampton Falls, NH
John Groff, Hartford, CT
Alan Hill, Manchester, MA
Bruce Munson, Beverly, MA
Edward Mowak, Needham, MA
Michael Sosik, Jr. Sturbridge, MA
Donald Swanson, Derry, NH
James Velleca, Cranston, RI

As part of the review process for consistency with applicable laws such as the CZMA and the ESA, the Council distributes this Draft FMP/DSEIS to the following individuals:

Ms. Kathleen Leydon, Maine Coastal Program
Mr. David Hartman, New Hampshire Coastal Program
Mr. Tom Skinner, Massachusetts Coastal Zone Management
Mr. Grover Fugate, Rhode Island Coastal Resources Council
Mr. Tom Oullette, Connecticut Office of Long Island Sound Programs
Mr. George Stafford, New York Division of Coastal Resources
Mr. Lawrence Torok, New Jersey Division of Coastal Resources

Mr. Nicholas Di Pasquale, Delaware DNREC
Ms. Gwynne Schultz, Maryland Coastal Zone Management Division
Ms. Laura McKay, Virginia Coastal Resources Management Program
Ms. Donna Moffitt, North Carolina Division of Coastal Management
Mr. E. James Tabor, Pennsylvania Department of Environmental Protection
Mr. Chris Brooks, South Carolina Ocean and Coastal Resources Management
Mr. Daniel Furlong, Mid-Atlantic Fishery Management Council
Mr. Robert Mahood, South Atlantic Fishery Management Council
Captain Vincent O'Shea, Atlantic States Marine Fisheries Commission

In addition, the Council prepares a notice to its "Interested Party" list for groundfish that announces the availability of the DSEIS and public hearing document and announces the schedule for public hearings. A Notice of Availability of the DSEIS is also published in the *Federal Register.* At that time, anyone on the "Interested Party" list or any other member of the public may call the Council office and request a copy of the DSEIS for their review. There are approximately 830 individuals on the "Interested Party" mailing list for groundfish. The Council also intends to make this Draft FMP/DSEIS available for downloading through its website (www.nefmc.org).

7.2.13 Index

The index can be found at the end of Volume I, section 8.5.

7.3 Other Existing Applicable Laws

7.3.1 Fishery Management Plans

There are many FMPs implemented in the U.S. EEZ within the same general geographic area as the management area for the Groundfish FMP. The following list identifies all known approved FMPs developed for the U.S. EEZ along the Atlantic Coast:

New England Council:	Atlantic Herring FMP; Atlantic Salmon FMP; Monkfish FMP; Northeast Multispecies FMP; Sea Scallop FMP; Red Crab FMP; Northeast Skate Complex FMP.
Mid-Atlantic Council:	Atlantic Mackerel, Squid and Butterfish FMP; Bluefish FMP; Dogfish FMP; Summer Flounder, Scup and Black Sea Bass FMP; Surfclam and Ocean Quahog FMP; Tilefish FMP.
South Atlantic Council:	Atlantic Coast Red Drum FMP; Coastal Migratory Pelagics FMP; Coral, Coral Reef and Live/Hard Bottom Habitats FMP; Golden Crab FMP; Shrimp FMP; Snapper Grouper FMP; Spiny Lobster FMP.
Secretarial Plans (NMFS):	American Lobster FMP; Atlantic Billfish FMP; Atlantic Tunas, Swordfish and Sharks FMP.

7.3.2 Treaties and International Agreements

Foreign fishing is prohibited within the U.S. EEZ for anadromous species and continental shelf fishery resources beyond the EEZ out to the limit of U.S. jurisdiction under the Convention of the Continental Shelf, unless authorized by an international agreement existing prior to passage of the Magnuson-Stevens Act and still in force or authorized by a Governing International Fishery Agreement issued subsequent to the Magnuson-Stevens Act. There are no pre- or post-Magnuson-Stevens Act agreements affecting the Northeast Multispecies Complex.

7.3.3 Federal Laws and Policies

All applicable Federal laws and policies, including the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) are identified and discussed in this section. The National Environmental Policy Act (NEPA) is discussed in Section 7.2.

7.3.3.1 Administrative Procedures Act

Sections 551-553 of the Federal Administrative Procedures Act establish procedural requirements applicable to informal rulemaking by federal agencies. The purpose is to ensure public access to the federal rulemaking process, and to give the public notice and an opportunity to comment before the agency promulgates new regulations.

The APA requires solicitation and review of public comments on actions taken in the development of a fishery management plan and subsequent amendments and framework adjustments. Development of this amendment provided many opportunities for public review, input, and access to the rulemaking process. During its scoping period the Council requested suggestions and information from the public on the range of issues that should be addressed and alternatives that should be considered in Amendment 13. Comments received during scoping are summarized in Section 7.2.2. Public comments were also received during the public comment period, in both written form and at a series of public hearings. See Section 8.4 for a list of public meetings at which proposed measures in Amendment 13 to the Northeast Multispecies FMP were discussed.

7.3.3.2 Coastal Zone Management Act

The Council has reviewed the coastal zone management programs for states whose coastal waters are within the range of areas affected by the proposed actions, including: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware and Maryland. It has determined that the proposed action is consistent with the CZM programs of those states and will send a notification of this determination, along with a copy of the amendment document, for their concurrence. Copies of the correspondence are on file at the Council office.

State Contacts

For a list of individuals contacted regarding the CZMA consistency determination for Amendment 13 to the Northeast Multispecies FMP, see Section 7.2.12.

7.3.3.3 Endangered Species Act

Section 7 of the Endangered Species Act requires federal agencies conducting, authorizing, or funding activities that may affect threatened or endangered species to ensure that those impacts do not jeopardize the continued existence of listed species. A discussion of the potential impacts of Amendment 13 is found in Section 5.2.11 of this document. The discussion concludes that the Amendment 13 measures will result in significant reductions in effort largely through a DAS reduction plan, that will not change the basis for the previous no jeopardy determinations for threatened or endangered species found in the FMP's management area. In addition, it is reasonable to assume that Amendment 13 is not likely to increase sink gillnet effort in the Northeast Region so that the current assessment of jeopardy to right whales could be revaluated.

For information on the ESA-listed species that will potentially be affected and a discussion of the potential impacts of the existing fishery and new Amendment 13 measures, see sections 5.2.9 (Volume I) and section 9.2.2 (Volume II).

7.3.3.4 Executive Order 12612 (Federalism)

The Executive Order on Federalism was established to restore the division of governmental responsibilities between the national government and the States and to ensure that the principles of federalism established in the E.O. guide federal departments and agencies in the formulation and implementation of policies. Nine fundamental federalism principles were established in the E.O. to guide federal legislation and policy development. The primary of these principles states that "federalism is rooted in the knowledge that political liberties are best assured by limiting the size and scope national government." In addition, federal departments and agencies that are developing policies that will affect the States must adhere to four policy-making criteria established in the E.O. which promote the authority and autonomy of the States.

While the policies established in Amendment 13 will affect certain States, they do not imply federalism implications sufficient to warrant preparation of an assessment under E.O. 12612. The affected states have been closely involved in the development of the proposed management measures through their involvement in the Regional Fishery Management Council process (i.e., all affected states are represented as voting members on at least one Council). This amendment was developed with the full participation and cooperation of the state representatives of the New England Council, and the Draft Amendment 13 will be provided to the Mid-Atlantic Council for their review and consideration. No comments were received from any state officials relative to any federalism implications of the proposed Amendment 13 to the multispecies FMP.

7.3.3.5 Executive Order 12630 (Property Rights)

The Executive Order on Property Rights was established to assist Federal departments and agencies in proposing, planning and implementing actions with due regard for the Fifth Amendment which provides that private property shall not be taken for public use without just compensation. Because this amendment addresses management of a public resource, it does not contain policies that have takings implications, as defined in the E.O.

7.3.3.6 Executive Order 12898 (Environmental Justice)

Executive Order (E.O.) 12898 requires that, "to the greatest extent practicable and permitted by law… each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions…" Due to data constraints and other concerns the means for conducting this analysis are not yet available at this stage of the public hearing process. Nonetheless, many of the participants in the groundfish industry may come from lower income and/or ethnic minority populations. These populations may be more vulnerable to more restrictive management measures. For example, in many ports crew may be comprised of ethnic minorities, and many regions in which fishing is an important livelihood can also be economically impoverished.

7.3.3.7 Regulatory Impact Review

This section provides the information necessary for the Secretary of Commerce to address the requirements of Executive Order 12866 and the Regulatory Flexibility Act. The amendment document contains all the elements of the RIR/RFA, and the relevant sections are identified by reference to the document.

The purpose and need for management (statement of the problem) is described in section 2.2 of this document. The proposed action is described in section 3.0 of the amendment document. The economic impacts are described in section 5.4 and summarized below under the discussion of how the proposed action is characterized under Executive order 12866 and the Regulatory Flexibility Act.

7.3.3.7.1 Executive Order 12866 (Regulatory Planning and Review)

The Executive Order on Regulatory Planning and Review was established to make the process of federal regulation more accessible and open to the public. In accordance with this E.O., the Council has:

- identified and assessed the issues requiring regulatory action and available alternatives to address these issues in Amendment 13;
- considered the degree and nature of risks posed by activities within its jurisdiction as well as the costs and benefits associated with the intended regulations;
- designed these regulations with consideration for flexibility, enforcement costs, distributive impacts and equity;
- based its decisions on the best reasonably obtainable scientific, technical, economic and other information;
- identified and assessed alternative forms of regulation;
- sought the views of State and local governmental entities to harmonize Federal regulations with relevant State regulations;
- avoided duplicative regulations with those of other Federal agencies;
- taken into account the costs of regulations on society;
- and drafted these regulations in a comprehensive and comprehensible manner.

E.O. 12866 requires a review of proposed regulations to determine whether or not the expected effects would be significant, where a significant action is any regulatory action that may

-
- Have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, of the principles set forth in the Executive Order.

Of these four criteria, the discussion to follow focuses only on the expected magnitude and duration of the economic impacts of the Proposed Action.

The Proposed Action would implement a management program that would achieve rebuilding of all groundfish stocks within 10 years for most stocks and within a longer time period for three stocks. The Proposed Action would be implemented in 2004 and would reach all rebuilding objectives by 2026 (with the exception of redfish). The Proposed Action would produce net benefits (the sum of consumer surplus, income payments, and profit) of $2.6 billion at a 7% discount rate. Compared to returning to regulatory measures that were in place in fishing year 2001 the Proposed Action produces higher net present value by $51 million and produces net present value $93 million higher than what current regulations would produce over the same time period. However, returning to fishing year 2001regulations or retaining current regulatory measures would result in fishing mortality rates that would be inconsistent with statutory obligations under the Sustainable Fisheries Act.

Economic analysis of the Proposed Action and all non-selected alternatives is reported in 5.4. These analyses include assessment of both long term economic benefits of different rebuilding strategies and short term impacts of the specific regulatory measures needed to achieve rebuilding targets in fishing year 2004. Based on these analyses, the Proposed Action would produce lower present value of net benefit than alternative rebuilding strategies but would implement a suite of management measures that would result in lower short term impacts on fishing and fishing related businesses, communities, and on the New England economy as a whole. Specifically, the Proposed Action would yield net present value of economic benefit $50 million lower than other rebuilding alternatives but would reduce overall gross sales impacts on the New England economy by between $18 and $82 million as compared to other non-selected alternatives with larger DAS reductions or hard TAC's.

Even though the Proposed Action would have generally lower short-term impacts, the estimated impact on the New England economy would still be substantial. Relative to 1998-2001 average conditions, gross sales for the New England economy as a whole were estimated to be reduced by $135 million. Note that this estimate of economic impact is likely to be overestimated for several reasons. First, the impact assessment did not take into account all possible adaptations or regulatory measures that would tend to offset predicted losses in sales. Second, changes in productivity associated with 1998-2001 average stock conditions as compared to the projected higher 2004 stock levels were not taken into account. Such changes in productivity would mean that at least some portion of DAS reductions would be offset by increases in catches by commercial fishing vessels and would make higher supplies of seafood available to dealers, processors, and consumers. Last, the $135 million reduction in gross sales represents a cumulative loss compared to 2001 and is not necessarily equal to an annual loss. These considerations make it difficult to determine whether or not realized economic impacts will exceed the $100 million level in 2004. Further, as long as access to stocks that may be fished at higher levels is realized, projected landings and revenues may actually increase under the Proposed Action compared to 2002 and 2003 levels. Even if possible landings are not realized in 2004, projected changes in resource conditions indicate that recovery to current levels will be relatively rapid and would be much higher over the longer term. This means that while the Proposed Action could have a $100 million or greater impact on the economy, it would not have a sustained adverse annual $100 million impact as landings hence gross fishing revenues and their attendant benefits to fishing related industries and communities are expected to recover quickly. Nevertheless, available economic impact estimates indicate that the Proposed Action will have an adverse economic impact on the New

England economy and the fishing and fishing related sectors in particular that may be cumulative for at least 2004 and for some years thereafter. Therefore, the Proposed Action is determined to be significant for purposes of the Executive Order. The following provides additional summary information on long term and short term impacts.

Long Term Economic Benefits
The choice of long term strategy to achieve rebuilding involves selection of a time frame and an overall approach to rebuilding. Economic analysis of a 2009 as compared to a 2014 rebuilding time frame for most stocks shows a net gain of between $12 and $40 million depending on the selected rebuilding strategy (see 5.4.3, Comparison of Economic Benefit of Alternative Rebuilding Times). Therefore, the Proposed Action implements a 2014 rebuilding time frame.

Economic analysis of alternative rebuilding strategies shows that the net present value of the Proposed Action would be $2,624 million (See 5.4.1) while net present value of the Constant fishing mortality rate approach (section 5.4.2.6), the Phased approach (section 5.4.2.7) and the Adaptive approach (section 5.4.2.8) would be $2,671 million, $2,625 million, and $2,680 million respectively. Thus, the Proposed Action would not produce the highest net benefit among all rebuilding alternatives. However, the Proposed Action does provide nearly equivalent net benefits to any other alternative from 2004 to 2008 and from 2015 to 2026. From 2009 to 2014 fishing mortality rates need to be comparatively lower than that of other rebuilding approaches for some stocks because of higher mortality rates that would result from 2004 to 2008.

The Proposed Action landings were estimated to be 146 million pounds in 2004 and rise to nearly 300 million pounds in 2014 (Table 368). Landings would continue to increase before reaching an equilibrium level of approximately 320 million pounds in 2026. Over the entire time frame the present value of accumulated revenues would be $2.8 billion. Adding $421 million in consumer's surplus to total revenues results in a gross benefit of $3.2 billion. The estimated present value of total costs was $607 million consisting of $374 million in fixed cost and $233 million in operating costs. Deducting these estimates of fishing cost from fishing revenues leaves $2.2 billion in present value of payments to fishing crew and captains and vessel owner profits. Adding consumer surplus to fishing returns in excess of costs results in a total net benefit of $2.6 billion.

The present value of each rebuilding alternative was evaluated using a discount rate of 7%. Sensitivity analysis using a range of discount rates indicates that all rebuilding alternatives would still yield superior net benefits compared to either maintaining current regulations or reverting back to the 2001 regulatory environment at all interest rates up to and including 10%. Further, the relative ranking of rebuilding alternatives was robust at interest rates below 7% but that the ranking of the Proposed Action in terms of net present value would fall below the Phased Alternative for interest rates above 7%.

Economic benefits were only measured for commercial fishing but the rebuilding program would also provide increased fishing opportunities to recreational anglers. Of the groundfish species targeted by recreational anglers cod and haddock are the most important. Economic effects on anglers are manifested in a change in the value or satisfaction that they derive from taking a recreational fishing trip. If the primary motivation for fishing is based on merely catching fish, then changes in measures that affect keep rates without change catch may have relatively little impact on recreational values. By contrast, if the primary motivation for fishing is keeping fish then measures that affect keep rates would result in a change in recreational values. Research indicates that recreational anglers are motivated by a variety of factors but neither cod nor haddock are noted "game" fish so it may be assumed that recreational values will be affected predominantly by increasing keep opportunities.

The Proposed Action would liberalize recreational regulations for GOM cod by changing the bag limit and by reducing the size limit for haddock. This means that anglers would benefit from greater keep opportunities upon implementation and would gain additional value over time as groundfish resources are restored.

Year	Landings	Total Revenue	Consumer Surplus	Gross Benefit	Fixed Costs	Variable Costs	Total Cost	Producer Surplus	Net Benefit
2003	130	128	11	139	31	29	59	68	79
2004	146	129	15	145	29	23	51	78	93
2005	163	135	17	152	27	17	44	91	108
2006	178	139	18	157	25	16	41	98	116
2007	194	141	20	161	23	14	37	104	124
2008	206	140	21	161	22	13	35	105	126
2009	195	128	18	146	20	11	31	97	115
2010	208	128	18	147	19	10	29	100	118
2011	221	128	19	147	18	9	27	101	120
2012	234	128	19	147	17	8	25	103	122
2013	246	126	19	145	16	8	23	103	122
2014	257	124	19	143	14	7	22	102	121
2015	299	129	24	154	14	8	21	108	132
2016	300	124	22	146	13	7	20	104	126
2017	301	119	21	139	12	7	19	100	121
2018	304	114	19	134	11	7	18	96	116
2019	306	109	18	128	10	6	16	93	111
2020	308	105	17	122	10	6	15	89	107
2021	311	100	16	116	9	5	14	86	102
2022	312	95	15	111	8	5	13	82	97
2023	314	91	14	106	8	5	13	79	93
2024	316	87	13	101	7	4	12	75	89
2025	319	83	13	96	7	4	11	72	85
2026	319	79	12	91	6	4	10	69	81
Total	6,084	$2,810	$421	$3,231	$374	$233	$607	$2,203	$2,624

Table 368 - Summary of Projected Landings (millions of pounds) and Discounted Economic Benefits (Benefits and Costs measured in millions of dollars discounted at 7%)

Short Term Impacts

Economic analysis of short term impacts included evaluation of comparative changes in gross fishing revenues (section 5.4.4), DAS needed in order to break-even (section 5.4.5), and total impacts on the New England economy (section 5.4.6). Additionally, analysis of potential business failure rates and relative change in profitability were examined for the Proposed Action (see section 7.3.3.7.2).

The Proposed Action would result in lowest impact in terms of relative change in total fishing revenues regardless of vessel size, gear, level of dependence on groundfish, home state, or port. However, the Proposed Action would still have significant impacts and may not appreciably change some of the distributive effects that may be expected to occur under one or more of the non-selected alternatives. For example, the Proposed Action would still have disproportional impacts on vessels with high dependence on groundfish. Across gear categories the Proposed Action would have similar impacts for 10% of the most impacted vessels regardless of gear but would still have an overall disproportionate impact on trawl vessels than either gillnet or hook vessels. With respect to vessel size (LOA), the Proposed Action would not have disproportionate impacts on vessels that are more than 70 feet as compared to vessels that are between 50 and 70 feet. However, vessels that were less than 50 feet in length were less impacted than either of the larger length categories. Vessel impacts among gear group and size categories indicate that small hook vessels will be disproportionately impacted compared to large hook vessels but would not be significantly more disadvantaged relative to other segments of the groundfish fleet. Unlike small hook vessels, small gillnet vessels would be less disadvantaged in terms of revenue loss compared to larger gillnet vessels. The same may be said for small as compared to medium and large trawl vessels. Revenue impacts among vessels from different home port states were largest for states that border the Gulf of Maine. Among these states, revenue impacts on Massachusetts vessels disproportionately affected compared to either Maine or New Hampshire vessels. Impacts on Maine vessels were similar to that of New Hampshire.

Since the Proposed Action would result in lower DAS reductions and in lower gross sales losses vessels would be more likely to have sufficient DAS allocations to remain above break-even and would result in lower overall impacts on the New England economy than any of the non-selected alternatives. As noted above, while the Proposed Action does reduce overall impacts, the potential DAS reductions are still likely to result in some vessels without enough DAS to break-even. Based on analysis of potential business failure rates (see IRFA) between 200 and 260 vessels may not be able to remain in business depending on levels of debt. Note that the analysis also indicated that the potential failure rate was highest for large trawl vessel than nay other gear or size class.

The short term impacts were evaluated based on empirical models and data that made it impossible to develop a comprehensive quantitative treatment of all management measures contemplated in the Proposed Action. Therefore, there are several measures that would be implemented under the Proposed Action that would offer the opportunity to mitigate the estimated short-term impacts.

The Proposed Action would implement a DAS leasing and a DAS transfer program. These programs both provide vessels with the opportunity to acquire additional DAS that may be used to offset DAS reductions. Economic analysis of DAS leasing (see section 7.3.3.7.2) indicates that profitability for both lessor and lessee would be improved. The analysis also indicates that leased DAS may flow from larger to smaller vessels and from Maine vessels to Massachusetts vessels. The former effect may be due to two factors. First, upgrade restrictions means that it is much easier to move DAS from larger to smaller vessels while large vessels may find it difficult to find trading partners. Second, the profitability analysis indicates that larger vessels may be less profitable than smaller vessels due to higher fixed cost payments, crew size requirements, and higher debt levels. This finding that leased DAS may flow from large to smaller vessels may be a reflection of differences in relative profitability indicating that leasing of DAS may be more driven by profit levels and will not necessarily go to vessels that land the most fish. The finding that leased DAS may flow out of Maine may not be surprising since the Gulf of Maine has more species of concern as compared to Georges Bank. However, as discussed below, the opportunity for using anything other than Category A DAS may be limited in the Gulf of Maine. This means that either DAS transfer or DAS leasing may be the most important programs available to Maine vessels to offset the Proposed Action DAS reduction. Thus, the demand for leasing may be greater in Maine than elsewhere so the net flow away from Maine may not be as large as predicted.

In addition to leasing, the Proposed Action would partition DAS into Category A, B, and C DAS, where the latter would not be available for use at least until all stocks have been rebuilt. Category A DAS would be available for general use upon implementation of the Proposed Action. The short-term impacts were estimated based only on the expected use of these Category A DAS. However, Category B DAS would also be allocated to fishing vessels that would be available for use in Special Access Programs (Reserve B days) or under specific circumstances (Regular B days) where stocks that may be fished at higher levels with low incidental catches of stocks of concern. The availability of these additional DAS will provide vessels an opportunity to increase total fishing time and income. At this time, identified Special Access Programs are limited to Georges Bank meaning that until other programs have been developed, the opportunity to use either Reserve or Regular B DAS will be limited to vessels that operate on Georges Bank. Generally, these programs may realistically be limited to larger vessels that have sufficient range and seaworthiness to take advantage of these programs (U.S./Canada resource sharing area and the Closed Area II Georges Bank Yellowtail Access program). A Special Access Program for hook gear in Closed Area I may provide an opportunity for some smaller vessels to use B DAS. As noted above, given the fact that the Gulf of Maine has a larger number of stocks of concern, the opportunity to use B DAS may be limited for vessels that fish in this area.

The Proposed Action would implement a process whereby groups of vessels owners may obtain a sector allocation. It also proposes a specific Georges Bank cod hook sector for implementation. While not implemented by the proposed action, a Georges Bank cod gillnet sector was considered and may be implemented in the future. The number of sector participants is not known at this time, nor are the specific details of how these sectors will operate. However, sector allocation may be used to design fishing rules that allow member vessels to land the same amount of fish, but do so in the least costly manner possible.

Compared to other non-selected alternatives, the Proposed Action would eliminate the raised footrope trawl proposed under Alternative 1. The Proposed Action would also delay use of differential DAS counting in the Southern New England yellowtail flounder stock area. The Proposed Action would provide for credit from steaming time to specific Special Access Programs, and would allow vessels to turn off VMS systems under certain circumstances.

7.3.3.7.2 Regulatory Flexibility Act (RFA)

The purpose of the Regulatory Flexibility Analysis (RFA) is to reduce the impacts of burdensome regulations and record-keeping requirements on small businesses. To achieve this goal, the RFA requires government agencies to describe and analyze the effects of regulations and possible alternatives on small business entities. On the basis of this information, the Regulatory Flexibility Analysis determines whether the proposed action would have a "significant economic impact on a substantial number of small entities."

The RFA applies to any rule or regulation that must undergo "notice and comment" under the Administrative Procedures Act (APA), specifically those rules published as proposed rules. When RFA applies, the Council must assess the impacts of the regulations to determine if they will have a "significant economic impact on a substantial number of small entities." See Sections 3.0, the description of the proposed action and section 5.4 impacts on the proposed action on vessels of different sizes and gear types. The Council also considered a large amount of input from the regulated entities and will evaluate the effectiveness and impacts of the proposed action on a continuing basis.

The Regulatory Flexibility Act (RFA) recognizes and defines three kinds of small entities: small businesses, small organizations, and small governmental jurisdictions. The established standards are:

- Any fish harvesting or hatchery business is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has annual receipts of not in excess of $3.0 million.
- For related industries involved in canned and cured fish and seafood or prepared fish or frozen fish and seafoods, a small business is one that employs 500 employees or fewer.
- For the wholesale industry, a small business is one that employs 100 or fewer.
- For marinas and charter/party boats, a small business is one with annual receipts not in excess of $5.0 million.
- A small organization is any not-for-profit enterprise that is independently owned and operated and not dominant in its field.

- A small governmental jurisdiction is any government or district with a population of less than 50,000.

In practice, although some firms own more than one vessel, the number of vessels is a reasonable proxy for the number of small business entities. The groundfish industry directly affected by the proposed action is composed primarily of small business entities. In 2001, about 549 otter trawls, 187 gillnet and 176 longline vessels participated in the Northeast fishery, including the Gulf of Maine and Georges Bank areas. The average annual revenues of these vessels were less than $3 million for the period 1994-2001. The tuna purse seine industry consists of five vessels with average annual revenues of less than $3 million in 1998 and 1999.

The RFA requires government agencies to evaluate the financial impacts of regulations on small entities. If NMFS can certify if a proposed or final rule will not have a "significant economic impact on a substantial number of small entities," it is not required to conduct a full RFAA or a periodic review of the resulting rules. Any certification statement should include the following:

- A statement of basis and purpose of the rule.

- A description and estimate of the number of small entities to which the rule applies.

- An estimate of economic impacts on small entities, by entity size and industry.

- An explanation of the criteria used to evaluate whether the rule would impose "significant economic impacts." Two criteria are considered for determining significance:

    - Disproportionality. Do the regulations place a substantial number of small entities at a significant competitive advantage to large entities?
    - Profitability: Does the regulations significantly reduce profit for a substantial number of small entities?

        - An explanation of the criteria used to evaluate whether the rule would impose impacts on a "substantial number of small entities." The term "substantial number" has no specific statutory definition and the criterion does not lend itself to objective standards.

- A description of, and an explanation of the basis for, assumptions used.

The purposed and basis for the proposed action are described in Section 2.0.

The Proposed Action would implement changes affecting any vessel holding a limited access groundfish permit, an open access hand gear-only permit, and vessels that hold an open access party/charter permit. Based on fishing year 2002 (FY2002) data the total number of small entities that may be affected would be 1,442 limited access permit holders, 1,994 hand gear permits, and 685 party/charter permits. However, since an open access permit holder may hold more than one permit, the total number of unique entities holding either a hand gear or a party/charter permit was 2,250 of which 1,565 held only a hand gear permit, 306 held only a party/charter permit, and 379 held both a hand gear and a party/charter permit.

The SBA size standard for small commercial fishing entities is $3.5 million in gross sales while the size standard for small party/charter operators is 100 employees. The commercial fishing size standard would apply to limited access permit holders as well as open access hand-gear only permits. Available data based on 1998-2001 average gross sales show that the maximum gross for any single commercial fishing vessel was $1.3 million. While an entity may own multiple vessels, available data make it difficult to determine which vessels may be controlled by a single entity. For this reason, each vessel is treated as a single entity for purposes of size determination and impact assessment. This means that all commercial fishing entities would fall under the SBA size standard.

Available vessel trip report data for party/charter operators indicate that vessels typically employ two or three crew per trip. While some operators are likely to have additional employees to arrange bookings and other business related activities the known scale of operations in the Northeast region make it very unlikely that any one entity would have more than 100 employees. Therefore, all party/charter businesses would fall under the SBA size standard. Note that vessels that may engage in both party/charter and commercial fishing activity are also considered small since neither gross sales or number of employees would be above the size standard for either type of activity.

Impacts on Limited Access Permit Holders
The Proposed Action would implement both a change in baseline DAS allocations and a number of management measures that would affect the manner in which available DAS allocations may be used. The latter would principally affect vessels that participate in the groundfish fishery while the latter would affect all vessels whether they are current participants or not.

Impact of DAS Allocation Baseline
The Settlement Agreement assigned baseline DAS allocations based solely on DAS that had been called-in during fishing years 1996 to 2000 and granted a minimum allocation of 10 DAS to all limited access permit holders. The Proposed Action would change this baseline by adding FY2001 to the qualification period but would also require that only years in which at least 5,000 pounds of regulated groundfish would count toward qualification. Vessels that either called in no DAS at all or never landed more than 5,000 pounds in a single year would receive a baseline allocation of zero although their full pre-settlement agreement allocation would be placed in Category C DAS.

Preliminary analysis of the Proposed Action indicates that the majority (599) of vessels would see no change in their effective effort baseline while 272 vessels would receive a higher allocation than their Settlement Agreement baseline. However, 52 vessels would have a lower baseline and 519 vessels would receive a zero baseline allocation. Of the vessels with a zero baseline, 394 were vessels that had received a minimum allocation and 125 were vessels whose baseline allocation was more than 10 DAS under the Settlement Agreement.

In effect, the Proposed Action places greater weight on providing for continued participation in the groundfish fishery to those vessels that may be comparatively more active and that may be more dependent on the groundfish fishery for business income. That is, reducing the potential pool of qualifying DAS makes it possible to achieve the same conservation objective with a lower DAS reduction to all remaining vessels that will receive a baseline allocation.

Vessels that receive no baseline allocation in FY2004 would not be able to fish for regulated groundfish until all stocks have been rebuilt and all Category B DAS have been converted to Category A DAS. While this prohibition may not have an immediate impact on fishing income (i.e. vessels that received no allocation have either not participated in the groundfish fishery over a five-year period or did participate but at a very low level), a loss of DAS does mean that the equity value of the business would be reduced. A loss in equity would affect the resale value of the vessel and may affect the ability to obtain business loans.

A total of 923 vessels would receive a non-zero baseline allocation; approximately the annual average number of vessels that have participated in the groundfish fishery since 1996. For these qualifying vessels the Proposed Action would have no affect on economic opportunities for the 519 vessels with no change in baseline DAS. It would increase economic opportunity for 272 vessels, while 57 boats with DAS allocations receive lower allocations. Approximately 500 vessels will receive zero DAS.

Economic Impact of Management Measures
In making a determination of whether any regulatory action will have a significant impact on a substantial number of small entities NMFS guidelines requires consideration of whether or not the proposed measure will have a disproportionate impact on small as compared to large entities and/or whether the action would have a significant impact on profitability for a substantial number of small entities.

Disproportionality
Since all entities were deemed to fall under the SBA size standard for small commercial fishing entities disproportionality does not apply as a standard against which small entity impacts would be compared to large entity impacts. Nevertheless, in section 5.4.4 of the FSEIS revenue impacts were estimated for several different vessel categories including total value of groundfish sales where groundfish sales classes were broken into four intervals based on quartiles of the distribution of 1998-2001 average groundfish sales for participating vessels. The findings in section 5.4.4 indicate that relative changes in total fishing income would have lower impact on vessels with total groundfish sales of less than $35,000 but would be similar for the most impacted vessels at all other sales intervals. Overall, vessels with the highest groundfish sales may be expected to be more affected by Amendment 13 management measures but that the Proposed Action would have lower revenue impact than any of the non-selected alternatives. To examine whether the Proposed Action would have disproportionate impacts based on total sales the revenue impacts were summarized by gross sales intervals where intervals were established as the quartiles of the distribution of 1998-2001 average gross sales.

Relative changes in total fishing revenues was not markedly different across all sales intervals at least among the 55 most impacted vessels in each sales interval, although the estimated impact at the 10^{th} percentile was greatest (-44.7%) for vessels with sales less than $65,000 (Table 369). However, revenue impacts on remaining 150 or so vessels in this sales category were generally lower and were even positive for some vessels as compared to vessels with higher gross sales. In fact, the overall impact was generally most burdensome on vessels with highest gross sales ($300,000 or more). Note that these estimated impacts would be higher for all sales intervals for any of the non-selected alternatives. Based on the estimated changes in gross fishing revenue the Proposed Action would have higher impact on vessels with highest total sales and would not, therefore, have a disproportionate impact on vessels with smallest total sales.

		Proposed Action	
Gross Groundfish Sales Intervals	Number of Vessels	Lower	Upper
$65,000 or less (n = 205)			
10th Percentile and Below	21	Minimum	-44.7%
10th to 25th Percentile	31	-44.7%	-28.8%
25th to 50th Percentile	51	-28.8%	-11.4%
50th to 75th Percentile	51	-11.4%	-0.3%
75th to 90th Percentile	31	-0.3%	12.7%
Above 90th Percentile	21	12.7%	Maximum
$65,001 to $150,000 (n = 218)			
10th Percentile and Below	22	Minimum	-38.0%
10th to 25th Percentile	33	-38.0%	-30.9%
25th to 50th Percentile	55	-30.9%	-17.7%
50th to 75th Percentile	55	-17.7%	-2.3%
75th to 90th Percentile	33	-2.3%	2.0%
Above 90th Percentile	22	2.0%	Maximum
$150,001 to $300,000 (n = 211)			
10th Percentile and Below	21	Minimum	-40.2%
10th to 25th Percentile	32	-40.2%	-33.8%
25th to 50th Percentile	53	-33.8%	-20.7%
50th to 75th Percentile	53	-20.7%	-8.9%
75th to 90th Percentile	32	-8.9%	-0.4%
Above 90th Percentile	21	-0.4%	Maximum
$300,001 or more (n = 214)			
10th Percentile and Below	21	Minimum	-41.5%
10th to 25th Percentile	32	-41.5%	-37.4%
25th to 50th Percentile	54	-37.4%	-26.0%
50th to 75th Percentile	54	-26.0%	-11.1%
75th to 90th Percentile	32	-11.1%	-3.9%
Above 90th Percentile	21	-3.9%	Maximum

Table 369 - Revenue Impacts by Fishing Vessel Gross Sales Size Classes

Profitability

Change in gross revenues provides an incomplete picture of the impact of the Proposed Action on vessel profitability making it difficult to determine whether any given vessel may cease business operations. Unfortunately, while available data permit tracking landings and revenues by vessel no comparable data collection system exists to collect a comprehensive set of operating, fixed, and debt service costs for the groundfish fleet. This means that it is not possible to directly provide a reliable numerical estimate of current profit levels or how many vessels may not able to remain profitable once the Proposed Action is implemented. However, a relative measure of profitability change and percent of possible business failures was estimated by simulating vessel costs and returns by using a combination of the cost data developed for the break-even DAS analysis (see section 5.4.5), available data, and the estimated reduction in effective effort. Specifically, empirical data were used to fit theoretical probability distributions for fixed costs, costs per day, annual revenue on groundfish trips, annual revenue on trips where groundfish were not landed, days absent on groundfish trips, and days absent on trips where groundfish were not landed. A Monte Carlo simulation was then run using 1,000 iterations to produce 1,000 different possible financial profiles or equivalently profit levels for each gear and size class developed for the break-even analysis. By simultaneously simulating a baseline scenario and the Proposed Action (the baseline groundfish days absent reduced by 45%) each realization produces a paired estimate of profit for the baseline and the Proposed Action. In this manner, groundfish revenue is directly linked to the DAS reduction but so too are the operating cost savings associated with a reduction in groundfish effort.

Calculations

The calculations used to estimate profitability for each iteration of the Monte Carlo simulation are reported in Table 370 where a single random draw from the probability distributions shown in row 2 (variable costs per day), row 3 (annual fixed costs), row 10 (annual trip revenue when groundfish are landed), row 11 (annual trip revenue when not landing groundfish), row 14 (total days absent), and row 15 (the proportion of groundfish days absent to total days absent). Data used to estimate these probability distributions came from several sources. Cost data come from the cost surveys described in Section 4.4.5. Since the break-even data were developed in FY2000 constant dollars, revenue data came from dealer reports for FY2000 while days absent data come from vessel trip reports. Note that, where appropriate, probability distributions were truncated at zero to assure that random draws would come only from the positive portion of the probability distribution. Also, annual groundfish trip revenue (row 10) was forced to be positively correlated with the proportion of groundfish days absent (row 15) while annual non-groundfish trip revenue (row 11) was forced to be negatively correlated with groundfish days absent. In this manner, random draws of groundfish revenue are sampled from the higher portion of groundfish revenue distribution when the proportion of groundfish days absent to total days absent is high. Conversely, random draws of non-groundfish revenues are sampled from the lower portion of the non-groundfish revenue distribution when the proportion of groundfish days absent to total days absent is high.

Rows 5 – 8 show differences among different gear-size groupings in terms of total gross sales but are not used in any calculations. Rows 18 – 21 show annual principal and interest payments to debt service. These values were determined by using the cost survey data. The cost survey data show that many vessels have no debt while others have high levels of debt payments. However, since there were so few observations with reported debt payments a probability distribution could not be estimated. Instead, four classes of debt (zero, low, medium, and high) were developed using quartiles for observations that did reported debt payments.

Rows 25 and 26 are the crux of the analysis of profitability analysis. Row 25 calculates total revenue per day on groundfish trips based on realized groundfish revenue (row 10) and groundfish days absent (row 12). Row 26 adjusts the realized groundfish days absent from row 12 by an adjustment factor reflecting the effective groundfish effort change (row 23). A value of 1.0 in row 23 would return the realized groundfish days absent in row 12 whereas a value of 0.55 (i.e. a 45% reduction from the baseline) would return 55% of the row 12 realization. Whereas total revenue and trip costs for trips that do not land any regulated groundfish are unaffected by a reduction in groundfish effort (see calculations in rows 34 and 35), total groundfish revenue and trip costs are dependent on groundfish days. This makes it possible to estimate changes in trip costs as groundfish effort changes and assures that a simulated reduction in groundfish revenue is derived from the same average revenue per day. In concept this is equivalent to simulating the impact on a single hypothetical vessel by assuring any change in realized profit is based on the same cost structure and the same average groundfish productivity.

Rows 37 and 38 sums total trip revenue from all sources (row 31 plus row 34), total trip costs (row 32 plus row 35) while row 39 is set equal to the realized fixed costs from the fixed cost distribution (row 3). These cost and returns are subdivided between crew (rows 42 to 46) and the boat (rows 49 to 52) based on the lay system identified in row 41. For all but medium and large otter trawl vessels the lay system is assumed to be what is known as a "clear" lay where revenues are split between the crew and the boat according in a fixed proportion and all trip costs are paid by the crew. For example, a 60/40 clear lay means that crew are paid 60% of total revenue received on the trip and trip costs are deducted from this amount. The remaining 40% share goes to the boat from to cover fixed costs, debt service, and owner profit. Medium and large trawls are assumed to use a "broken" lay in which crew receive a fixed proportion of trip revenue but trip costs are not deducted from crew share. In a broken lay system trip costs are paid by the boat as are all other costs.

Returns to debt service and owner profit (row 54) is determined as the difference between the gross revenue to the boat (row 50) and the sum of trip costs paid by the boat (row 51) and fixed costs (row 52). Owner profit depends on the magnitude of debt payments. Profit levels for vessels with no debt, low, medium, and high debt are calculated in rows 57 to 60 by deducting the corresponding debt values in rows 17 to 21 from row 54.

The Monte Carlo simulation results in 1,000 different paired profit levels with and without a 45% reduction in effective groundfish effort. As a combination of possible revenue and cost realizations the resulting profit estimates may be positive while others are negative. To construct a baseline, it was assumed that only realizations that resulted in positive profit (greater than or equal to zero) would be operating in the without effort reduction condition. Estimates of business failure rates and relative change in profit levels were then based on the paired comparisons where baseline profit was at or above zero.

Results

The potential business failure rate ranged from 25 to 35% for small vessels using long-line gear depending on debt levels (Table 371). For vessels that may remain above break-even, median reduction in profit level ranged from 47% to 56% for vessels with no debt and high debt respectively. Across all vessels, reductions in profit levels could exceed 80% while some vessels may experience more modest changes in profitability (between 8.0 and 25% depending on debt level). Available data does not make it possible to determine the mix of small long-line vessels by debt level. However, assuming a medium debt level represents a fleet average, 17 out of a total of 51 small long-line vessels (see Table 187 for total vessels by size-gear groupings) may be expected to cease business operations.

Larger long-line vessels had higher overall fishing revenues in FY2000 than small long-line vessels but also had higher estimated costs but these costs represented a small overall proportion of total fishing revenues which also means that business failure rates are also likely to be lower. Failure rates were estimated to range from a low of 9% for vessels with no debt and a high of 15% for vessels with high annual debt payments (Table 372). Median estimated reduction in profit level was also lower than small long-line vessels but still exceeded 37% regardless of debt level. At the medium debt failure rate, a total of 3 of 24 large long-line vessels may cease business operations under the Proposed Action.

Business failure rates for small gillnet vessels may range from 19 to 24% depending on debt level (Table 373). Median reduction in profit would be about 35% but may be much higher (more than 80%) for some vessels or may be less than 1% for others. Assuming a medium debt failure rate, 14 of 63 small gillnet vessels may be expected to cease business operations.

As was the case for larger hook vessels, larger gillnet vessels had higher overall fishing revenues but costs were not higher by the same proportion. For this reason, failure rates for large gillnet vessels were somewhat lower (from 15 to 21%) than for small gillnet vessels (Table 374). However, potential reductions in profit levels for vessels that would still be above break-even may be higher for large as compared to small gillnet vessels. Specifically, median profit reduction may be at least 50%; about 15 percentage points greater than estimated median impacts on small gillnet vessels. Using the medium debt level failure rate, a total of 23 of 118 large gillnet vessels may be expected to cease business operations.

Small trawl vessels (less than 50 feet in length) may have business failure rates between 27 and 33% depending on level of debt payments (Table 375). Median losses in profit levels for vessels that may still be able to break-even may be between 50 and 60% with some vessels experiencing much larger reduction in profitability (90% or greater for vessels with high debt) while others may experience much lower reductions in profit. Assuming that medium debt is consistent with a fleet average, about 55 of 187 small trawl vessels may go out of business under the Proposed Action.

The business failure rate for medium trawl vessels was estimated to range between 18 and 27% (Table 376). This failure rate was lower than that of small trawl vessels suggesting that these vessels may be able to take advantage of economies of scale that make them somewhat more resilient to adverse economic conditions. Median reduction in profit level ranged within a narrow interval of from 45 to 48%. Based on the medium debt failure rate, 48 of 218 trawl vessels would not be able to remain in business after Amendment 13 is implemented.

Large trawl vessels had the highest debt levels and generally had higher trip and fixed costs than any other vessel size or gear category. These higher costs were not offset by proportionally higher revenue that tends to produce lower profit margins than other vessel gear/size classes. For this reason the estimated business failure rate (between 31 and 43%) was the highest for large trawl vessels (Table 377). Similarly, median reductions in profit were also generally higher (53 to 61%) as were reductions in profitability for both the most affected and least affected vessels. Applying the medium debt failure rate to the 187 large trawl vessels included in the economic analysis in Section 4.4.4 results in a potential for 68 business failures.

Discussion

Based on the above analysis a total of 228 vessels of varying sizes and gear groups may not be able to remain in business under the Proposed Action. This estimate was based on the assumption that all vessels had a medium level of debt and may range from 190 to 260 depending upon which debt level best represent a fleet-wide average. These estimates are also contingent on the extent to which the simulated cost and returns reflect actual financial conditions in the groundfish fleet. Unfortunately, not enough cost data particularly on fixed costs and debt payments has been collected to evaluate the veracity of these results. This difficulty aside, the profitability analysis did not take into account differences in potential revenue generation that may exist for vessels that fish predominately in the Gulf of Maine as compared to elsewhere. The analysis also does not account for differences in how area closures may affect vessels particularly small as compared to large vessels. Finally, the analysis only took into account the potential effort reduction associated with the expected use of Category A DAS.

The Proposed Action contains a number of measures that would provide small entities with some degree of flexibility to be able to offset at least some portion of the estimated losses in profit. The major offsetting measures include the opportunity to use additional "B" DAS, leasing of DAS, DAS transfer, and sector allocation. As designed the Proposed Action would achieve target fishing mortality rates for most stocks but would achieve higher then necessary reduction for others. Category B DAS would be subdivided into two categories one which would be used in Special Access Programs (reserve B DAS) while the use of the remaining B days or Regular B DAS will be determined in a Framework Action. The primary purpose of B DAS is to provide access to and increased yield from stocks that may be fished at higher levels. These opportunities would enhance profitability for vessels that may be able to participate in any one or more of these special fisheries.

Particularly for vessels with few alternative fisheries, reductions in profit may be offset by the ability to acquire more DAS either through leasing or DAS transfer. The former would make DAS available to a vessel for a single fishing season whereas the latter would be a permanent transfer of DAS from one vessel to another. Transferred DAS would be subject to a 40% conservation tax on the transfer but vessels would be able to acquire both Category A and Category B DAS. By contrast, a DAS lease would not be subject to a conservation tax but vessels would be only allowed to acquire Category A DAS. Which option any given vessels may choose to pursue is not known but analysis clearly suggests that making DAS available in some form of exchange can improve overall profitability for both buyer and seller. The following discussion describes this analysis.

	A	B	C	D	E	F	G	H
1		Long-line < 40 feet	Long-line >= 40 feet	Gillnet < 40 feet:	Gillnet >= 40 feet	Trawl < 50 feet	Trawl 50 to 70 feet	Trawl >= 70 feet
2	Variable costs per day	Normal	Lognormal	Lognorm al	Lognorma l	Peearso n6	Pearson5	Logistic
3	Yearly fixed costs	Triangular	Pearson5	Triangu-lar	Pearson5	Beta	Pearson6	Beta
4	Gross Revenue Classes							
5	First Quartile	0 to 8,000	0 to 15,000	0 to 18,000	0 to 79,000	0 to 22,000	0 to 86,000	0 to 278,000
6	Second Quartile	8001 to 37,000	15,001 to 138,000	18,001 to 75,000	79,001 to 150,000	22,001 to 56,000	86,001 to 182,000	278,001 to 440,000
7	Third Quartile	37,001 to 78,000	138,000 to 366,000	75,000 to 150,000	150,001 to 225,000	56,000 to 100,000	182,001 to 310,000	440,000 to 670,000
8	Fourth Quartile	78,001+	360,000 +	150,000 +	250,000 +	100,000 +	310,000 +	670,000 +
9								
10	Trip revenue when landing groundfish	Pearson6	Beta	Beta	Beta	Beta	Exponenti al	Beta
11	Trip revenue when not landing groundfish	Extreme Value	RiskPearso n6	Pearson6	Loglogisti c	Beta	Beta	Pearson 6
12	Days absent on trips where groundfish are landed	B14*B15	C14*C15	D14*D15	E14*E15	F14*F15	G14*G15	H14*H15
13	Days absent on trips where groundfish are not landed	B14-B12	C14-C12	D14-D12	E14-E12	F14-F12	G14-G12	H14-H12
14	Total Days Absent	Beta	Inverse Gaussian	Normal	Logistic	Normal	Normal	Normal
15	Proportion of Groundfish Days Absent to Total	Empirical	Empirical	Empirical	Empirical	Empiric al	Empirical	Empirical
16								
17	Debt							
18	None	0	0	0	0	0	0	0
19	Low	1,931	3,242	1,931	3,242	2,853	4,094	26,582
20	Medium	4,458	4,674	4,458	4,674	4,708	16,128	34,870
21	High	7,922	15,613	7,922	15,613	8,876	24,943	54,964
22								
23	DAS Reduction	1.00	1.00	1.00	1.00	1.00	1.00	1.00
24								
25	Revenue per Day on trips landing groundfish	B10/B12	C10/C12	D10/D12	E10/E12	F10/F12	G10/G12	H10/H12
26	Days absent on trips where groundfish are landed	B12*B23	C12*C23	D12*D23	E12*E23	F12*F23	G12*G23	H12*H23
27								
28	Revenue per day on trips not landing groundfish	B11/B13	C11/C13	D11/D13	E11/E13	F11/F13	G11/G13	H11/H13
29	Days absent on trips where groundfish are not landed	B13	C13	D13	E13	F13	G13	H13

Table 370 – Explanation of profitability calculations

	A	B	C	D	E	F	G	H
1		Long-line < 40 feet	Long-line >= 40 feet	Gillnet < 40 feet:	Gillnet >= 40 feet	Trawl < 50 feet	Trawl 50 to 70 feet	Trawl >= 70 feet
30								
31	Total Groundfish Revenue	B26*B25	C26*C25	D26*D25	E26*E25	F26*F25	G26*G25	H26*H25
32	Total Groundfish Trip Costs	B2*B26	C2*C26	D2*D26	E2*E26	F2*F26	G2*G26	H2*H26
33								
34	Total Non-Groundfish Revenue	B11	C11	D11	E11	F11	G11	H11
35	Total Non-Groundfish Trip Costs	B2*B13	C2*C13	D2*D13	E2*E13	F2*F13	G2*G13	H2*H13
36								
37	Total Revenue	B31+B34	C31+C34	D31+D34	E31+E34	F31+F34	G31+G34	H31+H34
38	Total Trip Costs	B32+B35	C32+C35	D32+D35	E32+E35	F32+F35	G32+G35	H32+H35
39	Total Fixed Cost	B3	C3	D3	E3	F3	G3	H3
40								
41	Lay System (Crew/Boat)	Clear 60/40	Clear 50/50	Clear 60/40	Clear 50/50	Clear 50/50	Broken 50/50	Broken 50/50
42	Payments to Crew	0.6*B37	0.5*C37	0.6*D37	0.5*E37	0.5*F37	(G37-G38)*0.5	(H37-H38)*0.5
43	Trip Costs Paid by Crew	B38	C38	D38	E38	F38	0	0
44	Net Crew Income	B42-B43	C42-C43	D42-D43	E42-E43	F42-F43	G42-G43	H42-H43
45	Average Crew	2	3	3	3	2	3	5
46	Average Crew Income	B44/B45	C44/C45	D44/D45	E44/E45	F44/F45	G44/G45	H44/H45
47								
48								
49	Returns to Boat							
50	Revenue To Boat	B37*0.4	C37*0.5	D37*0.4	E37*0.5	F37*0.5	G37*0.5	H37*0.5
51	Trip Costs Paid by Boat	B38-B43	C38-C43	D38-D43	E38-E43	F38-F43	G38-G43	H38-H43
52	Fixed Costs	B3	C3	D3	E3	F3	G3	H3
53								
54	Return to Debt Service and Profit	B50-B51-B52	C50-C51-C52	D50-D51-D52	E50-E51-E52	F50-F51-F52	G50-G51-G52	H50-H51-H52
55								
56	Owner Profit	Small Hook	Large Hook	Small Gillnet	Large Gillnet	Small Trawl	Medium Trawl	Large Trawl
57	No Debt	B54	C54	D54	E54	F54	G54	H54
58	Low Debt	B54-B19	C54-C19	D54-D19	E54-E19	F54-F19	G54-G19	H54-H19
59	Medium Debt	B54-B20	C54-C20	D54-D20	E54-E20	F54-F20	G54-G20	H54-H20
60	High Debt	B54-B21	C54-C21	D54-D21	E54-E21	F54-F21	G54-G21	H54-H21

Table 370 – Explanation of profitability calculations (cont)

	No Debt	Low Debt	Medium Debt	High Debt
Percent Below Break-Even	24.7%	24.5%	32.1%	35.5%
10th Percentile	-80.1%	-84.8%	-85.8%	-86.2%
25th Percentil	-63.3%	-67.4%	-69.7%	-70.6%
50th Percentile	-47.0%	-50.8%	-52.7%	-56.1%
75th Percentile	-28.0%	-31.7%	-35.3%	-41.9%
90th Percentile	-8.0%	-8.1%	-16.2%	-24.8%

Table 371 - Simulation results for Long-line vessels less than 40 feet

	No Debt	Low Debt	Medium Debt	High Debt
Percent Below Break-Even	9.3%	10.3%	11.3%	14.8%
10th Percentile	-68.5%	-70.0%	-69.3%	-73.8%
25th Percentil	-54.4%	-55.7%	-56.1%	-59.7%
50th Percentile	-37.6%	-38.1%	-37.9%	-38.9%
75th Percentile	-12.7%	-13.1%	-13.0%	-12.7%
90th Percentile	-1.8%	-1.8%	-1.8%	-2.0%

Table 372 - Simulation results for Long-line vessels 40 feet and above

	No Debt	Low Debt	Medium Debt	High Debt
Percent Below Break-Even	18.8%	21.1%	22.7%	24.0%
10th Percentile	-76.0%	-79.3%	-80.2%	-79.3%
25th Percentil	-59.6%	-61.1%	-61.2%	-63.2%
50th Percentile	-35.3%	-35.3%	-35.6%	-31.9%
75th Percentile	-8.7%	-7.6%	-7.4%	-6.0%
90th Percentile	-0.5%	-0.6%	-0.7%	-0.5%

Table 373 - Simulation results for Gillnet vessels less than 40 feet

	No Debt	Low Debt	Medium Debt	High Debt
Percent Below Break-Even	15.1%	18.7%	19.1%	20.6%
10th Percentile	-74%	-71%	-72%	-84%
25th Percentil	-59%	-60%	-61%	-69%
50th Percentile	-49%	-50%	-51%	-57%
75th Percentile	-38%	-40%	-40%	-46%
90th Percentile	-22%	-23%	-24%	-27%

Table 374 - Simulation results for Gillnet vessels 40 feet and above

	No Debt	Low Debt	Medium Debt	High Debt
Percent Below Break-Even	27.1%	28.7%	29.5%	33.4%
10th Percentile	-81.7%	-85.1%	-84.5%	-90.2%
25th Percentil	-68.9%	-69.6%	-71.6%	-74.2%
50th Percentile	-53.0%	-54.5%	-55.6%	-59.0%
75th Percentile	-31.5%	-33.6%	-34.1%	-36.4%
90th Percentile	-13.0%	-13.2%	-13.1%	-15.0%

Table 375 - Simulation results for Trawl vessels less than 50 feet

	No Debt	Low Debt	Medium Debt	High Debt
Percent Below Break-Even	17.7%	18.4%	22.2%	26.8%
10th Percentile	-76.8%	-78.0%	-83.3%	-83.3%
25th Percentil	-59.4%	-60.6%	-65.2%	-64.8%
50th Percentile	-44.8%	-44.7%	-47.1%	-48.2%
75th Percentile	-21.8%	-21.3%	-22.4%	-23.8%
90th Percentile	-8.5%	-8.6%	-11.9%	-12.7%

Table 376 - Simulation results for Trawl vessels less than 50 to 70 feet

	No Debt	Low Debt	Medium Debt	High Debt
Percent Below Break-Even	31.0%	34.7%	36.4%	42.6%
10th Percentile	-81.7%	-87.5%	-86.7%	-90.9%
25th Percentil	-71.3%	-74.7%	-74.9%	-76.1%
50th Percentile	-53.1%	-57.5%	-59.5%	-61.3%
75th Percentile	-31.7%	-36.5%	-37.4%	-37.7%
90th Percentile	-17.3%	-18.0%	-19.5%	-19.9%

Table 377 - Simulation results for Trawl vessels above 70 feet

Economic Analysis of Days at Sea Leasing Program

The economic impact of a DAS leasing program was estimated by simulating a quota market using a mathematical programming model. The model maximized industry profits by choosing the days each vessel will fish (if any) of their own allocation, days they will lease from other vessels, and the number of their days they will lease to other vessels. Each vessel can only fish a maximum number of days at sea, which is the sum of their Category A DAS and their FY 2001 allocation. Days fished above their allocation of Category A DAS must be leased from other vessels. Vessels were also not allowed to be both a lessee and lessor, although in reality this could happen. Restrictions were placed on the model that did not allow days to be leased by larger vessels from smaller vessels, which were consistent with the restrictions passed by the Council. Results from the model yielded a very efficient outcome in terms of maximizing industry profit with as few vessels as possible. In reality, the actual leasing of quota among industry participants may not be as profitable as projected by the model. An individual vessel's activity level chosen by the model is determined by its productivity, the maximum allowable days it can fish, the lease price for days at sea, daily fishing costs, and the prices of each species, and a restriction which prohibit leasing of days from smaller vessels by bigger vessels. The model does not differentiate between areas fished, where vessels land their fish, and a variety of other factors that will influence the amount of quota leased, including other fisheries in which the vessel can participate, and it assumes perfect information among participants.

Vessels were grouped together regardless of gear type, and then stratified into fleets of 100 vessels[8]. Each fleet was then paired with itself, and then with every other fleet to simulate trades between all 1,345 vessels that could potentially lease quota. For each sector pair, the model was run fifty times in order to incorporate a stochastic lease price, which was generated based on results from a previous linear programming model. Lease prices used in the model ranged from $218 to $2,093, with a mean of $1,029. Results from the simulations were used to examine changes in profitability that would occur from allowing days at sea leasing.

Results

Results from the simulation runs were stratified by gear type and length of vessel. Class 1 vessels were less than 50 feet; class 2 vessels were between 50 and 69 feet, and class 3 vessels were 70 feet and greater. The

[8] The size of the non-linear programming model limited the maximum fleet size which could be analyzed, while incorporating a stochastic lease price.

three gear types examined were hook (50 vessels), trawl (1,126 vessels) and gillnet (169 vessels). There were more vessels in the model than had Category A DAS in the proposed action. Because vessels can fish up to the total of their Category A DAS and their FY 2001 allocation, vessels with zero Category A DAS can still lease days at sea, and therefore need to be included in the model. Because the model is attempting to maximize industry profit, under a DAS sea leasing scheme, fewer vessels will fish (Table 378). However, mean profits for all vessels will be higher than if days at sea trading were not allowed, and all vessels fished their allocation (Table 379). Mean profits are also higher than the mean profit levels generated during calendar year 2002 by vessels actually fishing.

Vessels which choose to lease all their quota can greatly enhance their profit since the owner is getting all the revenue from the lease without incurring any costs, and in particular not having to pay labor costs. The decision from a vessel perspective on whether to lease quota *to* other vessels is based on whether they can lease their quota for more then they would earn after paying crew share and covering other expenses[9]. If a vessel decides to lease quota *from* other vessels, it is based on whether they can earn more from a leased day at sea than what they will pay for the lease plus what they will pay to the crew, and to cover other expenses.

Model results generally showed the flow of lease days going from larger vessels to smaller vessels. Trawl and Gillnet vessels less than 50 feet in length were projected to use more days at sea than in 2002 under a DAS leasing scheme (Table 380). Trawl and Gillnet Vessels greater than 50 feet saw their days at sea usage decline from 2002 levels. Hook vessels were also projected to see their days at sea increase. Restrictions on DAS trading make it difficult for larger vessels to lease from smaller vessels, but the opposite does not hold. Small vessels have a large potential number of vessels that they can lease from, which is what model results show. Examination of both tables 2 and 3 show that larger vessels can profit by leasing their days to smaller vessels. For example, length class 2 trawl vessels average profit was $68,387 using an average of 36.92 days of effort under a DAS leasing scheme, while their average profit was $31,428 using 46.13 days of effort in 2002. Small trawl vessels average profit was $41,111 using 31.9 days of effort under days at sea leasing, while their 2002 average profit was $12,271, and their average days at sea was 25.13. This demonstrates that both sectors would be better off with a DAS leasing program than fishing at their calendar year 2002 effort levels.

Additionally, the average profit levels were projected to be higher under days at sea leasing than if the vessels fished at their allocated 2004 levels. This demonstrates days at sea leasing provides substantial regulatory relief to vessels compared with no leasing.

[9] The particular costs faced by each vessel depend on the particular lay system they employ. For the purposes of this model, it was assumed the vessel paid the variable operating costs such as fuel and ice, and then paid the crew. This simplified the model slightly, but may underestimate the profit that each vessel owner would earn under a days at sea leasing program if they decide to fish.

		Vessels with	Fishing Under
	Length	2004	DAS
Gear Sector	Class	Days	Leasing
Hook	ALL	41	30
Trawl	1	300	141
	2	211	97
	3	203	100
Gillnet	1	127	110
	2	18	10
Total		900	488

Table 378 - Number of Vessel Fishing in 2002 and Number Fishing with Days at Sea Leasing

			Profit (Mean Per Vessel)		
	Length			2004	2002
Gear Sector	Class	Vessels	Leasing	Allocation	Effort
Hook	ALL	50	78,700	39,806	24,247
Trawl	1	603	41,111	16,383	12,271
	2	266	68,387	30,102	31,428
	3	257	97,050	56,700	74,890
Gillnet	1	148	82,320	54,047	38,514
	2	21	74,644	46,945	53,465

Table 379 - Mean Profit per Vessel under Days at Sea Leasing

			Days Fished			
	Length					2002
Gear Sector	Class	Vessels	Leasing	Total	Sell	Effort
Hook	ALL	50	37.0	59.0	15.0	28.0
Trawl	1	603	19.28	31.91	19.30	25.13
	2	266	22.09	36.92	30.48	46.13
	3	257	21.52	46.26	34.92	70.00
Gillnet	1	148	42.79	70.89	18.44	33.07
	2	21	32.98	54.25	34.09	61.63

Table 380 - Average Days Fished and Leased by Gear Type and Length Class

Impact on Party/Charter Operators

The Proposed Action would relax current restrictions on the bag limit for Gulf of Maine party/charter passengers and would permit passengers to retain a two-day equivalent of the daily bag limit on trips that take place over two calendar days and that are at least 15-hours in duration. These measures would affect any vessel that chose to take passengers for-hire in the Gulf of Maine where cod were caught. While there are a large number of vessels that hold a party/charter groundfish permit there have only been about 120 vessels that have actually reported landing Gulf of Maine cod when taking passengers for hire. Of these vessels, the majority earn at least 75% of fishing income from passenger fees. Although the impact of a relaxation of the Proposed Action recreational measures cannot be estimated using available data there is little doubt that the higher bag limit will be more attractive to party/charter customers which should result in higher passenger loads and an overall improvement in party/charter business profits.

Impact on Hand-Gear Only Permit Holders

The Proposed Action would convert the existing open access hand-gear permit into a limited access category and an open access category. Vessels that qualify for a limited access permit would benefit from a relaxation on the cod trip limit and would not be subject to trip limits on any other species. Vessels that do not qualify for limited access would still be able to obtain and open access permit but the cod trip limit would be much lower than current hand-gear only permit holders may retain. Available data show that even though a large number of open access hand-gear permits have been issued in the past not much more than 10% of these permits actually report landings of any amount of either cod or haddock. A preliminary assessment of qualification indicates that approximately 150 vessels would qualify for a limited access hand-gear only permit which just about as many vessels with documented landings in any given year since 1997. Thus, the conversion to a limited access permit with the potential to achieve higher landings and higher incomes overall also may permit the majority of small entities currently participating in the fishery to continue operating.

7.3.3.8 Executive Order 13158 (Marine Protected Areas)

The Executive Order on Marine Protected Areas requires each federal agency whose actions affect the natural or cultural resources that are protected by an MPA to identify such actions, and, to the extent permitted by law and to the extent practicable, avoid harm to the natural and cultural resources that are protected by an MPA. The E.O. defines a Marine Protected Area as “any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein.”

The Departments of Commerce and the Interior are jointly developing a list of MPAs that meet the definition of MPA for the purposes of this E.O. As of the date of submission of the FSEIS, the list of MPA sites has not been developed by the departments. However, it is likely that when the list is available the Stellwagen Bank National Marine Sanctuary and the Council’s year-round groundfish closed areas (Closed Area I, Closed Area II, Nantucket Lightship Closed Area, and Western Gulf of Maine Closed Area), at a minimum, will meet criteria for an MPA and will likely be listed.

The E.O. promotes the development of MPAs by enhancing or expanding the protection of existing MPAs and establishing or recommending new MPAs. Amendment 13 proposes modifying and expanding existing year-round groundfish closures to afford more protection to sensitive benthic habitat as well as establishing new area closures for habitat protection. This is consistent with the goals of E.O. 13158, which support the use of closed areas as management tools for habitat protection.

7.3.3.9 Marine Mammal Protection Act

The NEFMC has reviewed the impacts of Amendment 13 on marine mammal species and has concluded that the management actions contained in Amendment 13 are consistent with the provisions of the MMPA. The take of harbor porpoise under the existing FMP have been reduced to the point that would allow the stocks to achieve optimum levels. The level of take for the remaining odontocetes and seals that are affected by this fishery are low enough, in relation to the size of their populations, that it has been determined that the stocks would be allowed to achieve optimum levels. Therefore, since the mortality and serious injury that is likely to occur under the existing FMP has been assessed relative to the PBR allowed for each species under the MMPA and found to be below those levels, the NEFMC concludes that Amendment 13 will further reduce effort providing additional protection to these species.

7.3.3.10 Paperwork Reduction Act

Materials and analysis required under the PRA will be submitted under separate cover after the final SEIS is prepared.

7.3.3.11 Data Quality Act (P.L. 106-554)

The Data Quality Ac directed the Office of Management and Budget to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by federal agencies." NOAA guidelines are available at http://www.noaanews.noaa.gov/stories/iq.htm and are not repeated here. Amendment 13 falls under the category of a Natural Resource Plan. It is a composite of several different types of information, including scientific, management, and stakeholder input, from a variety of sources. Compliance of this document with NOAA standards is evaluated below.

Utility: The information disseminated by this Amendment is intended to describe proposed management actions and the impacts of those actions. As such, it is intended to be useful to:

-Industry participants so they can provide informed comment on their preferred alternatives
-Managers/policy makers so they can choose alternatives

Section 9.0 provides background information so that the impacts described in section 5.0 can be more fully understood.

Integrity: Confidential information is not reported in this amendment as provided by 50 CFR Subpart E. Sources of data are clearly described and referenced.

Objectivity: Information is provided in an unbiased manner. Where necessary, descriptions of analytic techniques are provided so the limitations of the analyses can be understood. Where possible, variation in scientific information is reported so the uncertainty of estimates can be evaluated. Data sources are clearly described, and citations to referenced documents are included.

This Amendment is developed in accordance with NMFS Operational Guidelines for Fishery Management Plans. A wide range of information has been incorporated. The information is presented in such a way that clear policy choices can be made for the major issues. Information included has been reviewed prior to incorporation through a wide range of processes, including formal peer reviews, informal reviews by the Groundfish Plan Development Team, and public review through participation in Council meetings. In addition, before this plan is final, additional public and private reviewers will be afforded an opportunity to comment, and the comments will be considered in the preparation of the final SEIS.

7.3.4 State and Local Laws and Policies

Federal fisheries permit holders fishing in state waters must adhere to federal fisheries regulations unless they are specifically exempted or the state regulations are more restrictive. The following is a summary of state regulations relevant to groundfish.. Most states are in the process of adjusting their groundfish regulations to reflect changes made by NMFS to federal groundfish reulgations in July, 2003. These changes are not shown below.

MAINE

Licensing and Reporting Requirements

- Non-resident commercial fishermen in the groundfish fishery must report time and location of fishing, gear used, and species and catch information by phone or written report to the Bureau of Marine Patrol.

Seasonal/Area Closures

- No fishing, taking or possession of federally regulated groundfish species in Sheepscot Bay and Boothbay from May 1-June 30.

Size Limits

Species	Commercial Minimum Size	Recreational Minimum Size
Atlantic cod	22”	23”
haddock	19”	23”
pollock	19”	19”
witch flounder	14”	14”
yellowtail flounder	13”	13”
American plaice	14”	14”
Atlantic halibut	36”	36”
winter flounder	12”	12”
redfish	9”	9”

Gear Restrictions

Recreational—

- Charter, party and recreational vessels are prohibited from fishing for groundfish with more than 2 hooks per line and more than 1 line per angler, and must stow all other fishing gear on board the vessel.

Commercial—

Gear type	Mesh size	Net Limit	Hook type	Hook Limit
trawl net, sink gillnet, Scottish seine, mid-water trawl	≥ 6” diamond/square in body and wings; ≥ 6.5” diamond/square in cod end	not specified	N/A	N/A
stand-up gillnet	≥ 6.5”	max. 50 nets	N/A	N/A
tie-down gillnet	≥ 7”	max. 100 nets; for mesh ≥ 10”, max. 150 nets	N/A	N/A
tub trawl, longline	N/A	N/A	size 12/0 or greater circle hooks only	2000

- Use of crucifiers with less than 6” spacing between fairlead rollers is prohibited.

Possession Limits

Atlantic cod

Commercial- maximum 500 lbs. landed/possessed daily

Atlantic halibut
See "Species-specific Regulations" section, below.

<u>Species-specific Regulations</u>
Atlantic halibut
Open seasons—

- Sunrise May 1-Sunset July 31 east of line from Schoodic point due south (magnetic) in territorial waters; Sunrise April 1-Sunset June 30 west of above line.

Minimum size— 36"
Possession limit—

- Possession of other species is prohibited while fishing for Atlantic halibut.
- Commercial- 4 fish/day
- Recreational/Party/Charter- 1 fish/day

Quota—

- Commercial/Recreational- No more than 50 fish/season

Gear restrictions—

- Size "14oo" or greater circle hooks up to a maximum of 450 circle hooks/day

License—

- Licensed commercial fishermen must receive an Atlantic halibut endorsement on a fishing license issued by the ME Department of Marine Resources. To receive this endorsement, a fisherman must contact the DMR before March 1 and participate in a tagging and release training program.

Additional requirements—

- Those fishing for halibut are required to maintain a log of halibut catches with specific information about each fish and may also be asked to take observers on board and preserve certain halibut organs for laboratory examination.

NEW HAMPSHIRE

<u>Size Limits</u>

Species	Commercial Minimum Size	Recreational Minimum Size
Atlantic cod	22"	23"
haddock	19"	23"
pollock	19"	none
yellowtail flounder	13"	13"
American plaice	14"	14"
winter flounder	12"	12"
redfish	9"	9"

- Cod/haddock must have head and tail intact or as fillets with skin intact, no less than 14" long.

<u>Gear Restrictions</u>
Hook Gear—

- Cod, haddock, pollock, white hake, redfish, American plaice, windowpane flounder, witch flounder, winter flounder, and yellowtail flounder may not be taken during the months of April, May and June.
- Only circle hooks size 12/0 when using bait
- No more than 800 circle hooks
- Fairlead rollers must have 6" spaces between each

Gillnets—

- Cod, haddock, pollock, white hake, redfish, American plaice, windowpane flounder, witch flounder, winter flounder, and yellowtail flounder may not be taken during the months of April, May and June.
- No more than 25 nets, each no greater than 300 feet long
- Gillnets used to take the above species from the Great Bay estuarine system inland of Memorial Bridge in Portsmouth, Little Harbor and tributaries inland of its most seaward jetty, Rye Harbor and tributaries inland of its most seaward jetty, and inland of Hampton Harbor Bridge may be used April 16-October 31 only, 2 hours before sunrise until 2 hours after sunset. Gillnets must be within eyesight (unaided by binoculars and other such magnification instruments) of the fishing vessel at all times and must adhere to the following specific ations:
    - = 3" mesh
    - = 100 feet long, = 7 feet wide

Possession Limits
- Cod and haddock may only be taken recreationally during the months of April, May and June.
- Recreational daily limit
    - 10 cod/haddock combined, April 1-Nov 30
    - 5 cod/haddock combined Dec 1-March 31
- Commercial daily limit
    - 500 lbs. cod by gillnet
    - 200 lbs. cod, haddock or yellowtail flounder combined by hook gear

MASSACHUSETTS

Licensing and Reporting Requirements
- Special permit required for at-sea processing
- Permit required for participation in gillnet fishery

Seasonal/Area Closures
- Month of May— upper Cape Cod Bay and Massachusetts Bay north of 42°, south of 42°30'
- Month of June— north of 42°30' from Marblehead to the New Hampshire border
- April-May and Oct.-Nov.— Cape Cod Bay and Massachusetts Bay from Plymouth north to Marblehead
- April-June— upper Massachusetts Bay and Ipswich Bay from Marblehead to the New Hampshire border
- From May 1 to May 31 it is illegal to possess groundfish species east of Cape Cod south of 42°N and east of 70°W

Size Limits

Species	Commercial Minimum Size	Recreational Minimum Size
Atlantic cod	22"	23"
haddock	19"	none
pollock	19"	none
yellowtail flounder	13"	13"

Gear Restrictions

Gear type	Mesh size	Net Limit
trawls	≥ 6½” throughout entire net north and east of Cape Cod, Jan. 1-Dec. 31; ≥ 6½” throughout entire net south of Cape Cod, Nov. 1-April 22; ≥ 4½” throughout entire net in area defined in state regs, June 1-Oct. 31	not specified
sink and flatfish gillnets	≥ 6½” throughout entire net	not specified

- Line-trawling for cod permitted during certain time and area closures with certain hook restrictions, as specified in state regs.
- No disks rollers, or rockhopper gear greater than 18” in diameter
- Vessels over 90 feet in length are prohibited from fishing in MA state waters
- Rod-and-reel, handlines, and longlines may be used in January with written permission of the MA Department of Marine Fisheries director

Gillnets—

- North of Cape Cod— Bottom/sink gillnets prohibited Nov. 1-Nov. 30 and March 1-March 31 in certain designated areas
- South and west of Cape Cod— Gillnets (all types) prohibited April 1-November 15, with few exceptions
- Massachusetts Bay— Bottom gillnets prohibited May 15-November 1 within designated management area

Possession Limits

- Recreational daily limit
  - 10 fish/person/day, April-November
  - 5 fish/person/day December-March
- Commercial daily limit
  - 500 lbs./24-hour day North of Cape Cod
  - 2,000 lbs./24-hour day South of Cape Cod

Atlantic cod

- Gonads may not weigh more than 10% of the total weight of cod aboard vessel
- No removal of gonads from fish smaller than the minimum size

- Small-mesh fishermen in upper Cape Cod Bay Whiting Area may not possess cod, haddock, pollock, redfish, white hake, yellowtail flounder, winter flounder, windowpane flounder, American plaice, witch flounder and ocean pout

Species-specific Regulations

Winter Flounder

Possession limit—

- No possession of winter flounder in Mount Hope Bay and tributaries May 20-Sept. 27 and Oct. 29-April 12
- Daily limit of 4 winter flounder (24-hour period) April 13-May 19 and Sept. 28-Oct. 28
- Commercial- No taking winter flounder from Mount Hope Bay and tributaries
- Recreational- 8 winter flounder/person at one time; reduced during March 1-April 30 to 3 winter flounder/person at one time

RHODE ISLAND

Licensing and Reporting Requirements

- Upon request of the RI Dept. of Environmental Management, every owner/operator and dealer must make either or both a telephone report or written report of activities

Seasonal/Area Closures

- Recreational closed season for winter flounder— April 20-May 27 and Sept. 28-Oct. 28
- Commercial closed season for winter flounder— March 1-Sept. 30 and Oct. 1-Nov. 15

Size Limits

Species	Commercial Minimum Size	Recreational Minimum Size
Atlantic cod	19”	20”
haddock	19”	19”
pollock	19”	19”
American plaice	14”	14”
winter flounder	12”	12”
yellowtail flounder	13”	13”
witch flounder	none	14”

Gear Restrictions

- No mechanical trawling device, beam, pair or otter trawl allowed in Narragansett Bay and various associated rivers and ponds in Narragansett Bay watershed except in some designated areas (these areas are described in detail in the state regulations)
- No setting, hauling or maintaining a trawling device in any listed channels, ponds, or rivers (refer to state regs)
- Beam, pair and otter trawls or other mechanical trawling devices are allowed in the upper Narragansett Bay Trawling Area between July 1 and Nov. 1, except on weekends and legal state holidays
- No setting, hauling or maintaining a seine along the shoreline within a half mile in both directions of the seaward entrance of various specified ponds and rivers open to the sea, extending seaward for 300 yards
- Except for menhaden, it is illegal to set, maintain, or haul a gillnet for any species in the Pawcatuck River or Little Narragansett Bay and within 1.5 miles south and west of Napatree Point
- Traps, pots and stationary gear must be marked with the license number, name of owner and a buoy
- Use of explosives as a fishing device prohibited
- Additional gear restrictions apply to certain ponds, described in the state regs.

Gillnets—

- A license is required to fish using a gillnet. Any RI resident is eligible for a license. Cost: $200.
- Near- and off-shore ends of all gillnets must be marked with orange/fluorescent orange bullet shaped buoys with minimum dimensions 9”x16”; buoys must be marked with name/license number of owner and “GN” in letters at least 3” tall
- Each gillnet must be hauled once per day (24 hr. period, midnight to midnight)
- Gillnets may not be set, hauled or maintained within 3,000 ft. of a fish trap licensed by the RI Department of Environmental Management
- Floating gillnets must be constantly tended (operator must remain within 100 ft. of the net at all times)
- Mesh for bottom tending gillnets must be less than 5”

- State regulations specify some additional setting and spacing restrictions and seasonal closures for gillnet use

Species-specific Regulations

Winter Flounder

- Permit required for fishing for winter flounder
- Minimum mesh size of 6” required throughout state waters and across all gear types while fishing for winter flounder
- Harvesting or possession of winter flounder prohibited in Narragansett Bay north of lines from So. Ferry Road in Narragansett to Ft. Getty; Ft. Wetherill to Ft. Adams; Sandy Pt. to High Hill Pt.
- A winter flounder Coastal Marine Life Management Area (CMLMA) is established in all state waters north of a line from Sakonnet Point Light to Pt. Judith Light; no possession of winter flounder while fishing in CMLMA

- Fishing for winter flounder in CMLMA prohibited from 1 hour after sunset until 1 hour before sunrise (except with gill and fyke nets)
- CMLMA annual commercial winter flounder quota, for all gear types, is divided into two seasons:
  - 1st season—March 1 until half of the annual quota is landed
  - 2nd season—October 1-November 15, unless the entire quota is reached before Nov. 15
- Quota overages are subtracted from the next year’s allocation
- Recreational possession limit for winter flounder: 4 fish/person/day
- Commercial trip limit for winter flounder: 100 lbs/day in coastal ponds within the CMLMA, 300 lbs/day in other areas (south end of CMLMA). While fishing in the entire CMLMA, 300 lb. possession limit applies.

CONNECTICUT

Size Limits

Species	Commercial Minimum Size	Recreational Minimum Size
winter flounder	12”	12”
Atlantic cod	19”	none
yellowtail flounder	13”	none
haddock	19”	none
pollock	19”	none
witch flounder	14”	none
American plaice	14”	none
redfish	9”	none

NEW YORK

The State of NY is in the process of amending its current groundfish regulations. Current regulations and proposed changes are described separately below. Changes to the current regs will most likely be implemented by the end of September, 2002.

Current

Licensing and Reporting Requirements

- A fishing license must be carried at all times while fishing

Size Limits

Species	Commercial Minimum Size	Recreational Minimum Size
Atlantic cod	19”	21”
haddock	19”	21”
pollock	19”	19”
yellowtail flounder	13”	13”
winter flounder	12”	11”

Species-specific Regulations

Winter Flounder

- Recreational open season— 3rd Saturday in March-June 30 and Sept. 15-Nov. 30
- Recreational trip limit— 15 fish/vessel during fishing time (not less than 24 hours)
- Commercial open season, by gear-type—
    - pound and trap nets: July 26-June 14
    - fyke nets: Oct. 1-March 22
    - all other gear: Dec. 1-June 13

Proposed Additions

- At-sea transfer of any species with a possession limit is prohibited
- Some new reporting requirements are proposed
- Possession of winter flounder is prohibited in recreational and commercial fisheries.
- Fish pots/traps must be tagged (color coded) indicating year issued by the NY Dept. of Environmental Conservation

Fish Trap Specifications	**Circular Vents**	**Rectangular Vents**
Max. Number Vents	1	1
Max. Size of Opening	diameter: 23/8”	dimensions: 11/8” x 5¾”

NEW JERSEY

Licensing and Reporting Requirements

- An individual applying for a gillnet license must have possessed a gillnet license for at least one of the two previous years. Otherwise, the applicant must file an application in person for two consecutive years.

Open Recreational Seasons

Species	Season
winter flounder	March1-May 31; Sept. 15-Dec. 31
Atlantic cod	Jan. 1-Dec. 31
haddock	Jan. 1-Dec. 31
pollock	Jan. 1-Dec. 31

Size Limits

Species	Commercial Minimum Size	Recreational Minimum Size	Minimum Fillet Size
Atlantic cod	21”	21”	14”
haddock	21”	21”	14”
pollock	19”	19”	13”
winter flounder	12”	11”	none

Gear Restrictions

- All gear must be legibly, indelibly marked with the gear ID number of the owner
- Stakes to mark various nets must stand at least 2 feet above mean high water, and must be visible from all sides:
  - reflectors may not be less than 2” in diameter
  - reflective tape may not be less than 2” wide
  - light colored squares may not be less than 2’ square
  - light colored jugs/buoys may not be less than 12” in diameter
- No unattended overnight staked/anchored gillnets June 15-Oct. 31 (operator must be less than 1500 ft. from the nearest portion of the net)
- Gillnet mesh must be =2.75” stretched in tributaries of Delaware Bay or =3.25” stretched Jan. 1-Feb. 29

Species-specific Regulations

Winter Flounder

- Use of fyke net for capturing winter flounder prohibited Feb. 20-Oct. 31
- Use of other commercial gear for capturing winter flounder prohibited June 1-Nov. 30

Other

- Removal of head, tail, skin or mutilation which prevents accurate identification of the species is prohibited.
- A party boat owner may apply for a Special Fillet Permit for a specific vessel, subject to the following restrictions:
  - Once fishing commences, no parts or carcasses of Atlantic cod, haddock, pollock, winter flounder and other flatfish (as well as some species not managed under the Northeast Multispecies FMP) may be discarded overboard; only whole or live fish may be returned to the water.
  - No fillet of any flounder or other flatfish shall be less than 8 inches in length between May 1 and Oct. 31 or less than 5 inches in length from Nov. 1 to April 30.
  - See minimum fillet sizes in “Size Limits” section, above.

8.0 References

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8.2 Glossary

Adult stage: One of several marked phases or periods in the development and growth of many animals. In vertebrates, the life history stage where the animal is capable of reproducing, as opposed to the juvenile stage.

Adverse effect: Any impact that reduces quality and/or quantity of EFH. May include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include sites-specific of habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.

Aggregation: A group of animals or plants occurring together in a particular location or region.

Anadromous species: fish that spawn in fresh or estuarine waters and migrate to ocean waters

Amphipods: A small crustacean of the order Amphipoda, such as the beach flea, having a laterally compressed body with no carapace.

Anaerobic sediment: Sediment characterized by the absence of free oxygen.

Anemones: Any of numerous flowerlike marine coelenterates of the class Anthozoa, having a flexible cylindrical body and tentacles surrounding a central mouth.

Annual total mortality: Rate of death expressed as the fraction of a cohort dying over a period compared to the number alive at the beginning of the period (# total deaths during year / numbers alive at the beginning of the year). Optimists convert death rates into annual survival rate using the relationship S=1-A.

ASPIC (A Surplus Production Model Incorporating Covariates): A non-equilibrium surplus production model developed by Prager (1995). ASPIC was frequently used by the Overfishing Definition Panel to define B_{MSY} and F_{MSY} reference points. The model output was also used to estimate rebuilding timeframes for the Amendment 9 control rules.

Bay: An inlet of the sea or other body of water usually smaller than a gulf; a small body of water set off from the main body; e.g. Ipswich Bay in the Gulf of Maine.

Benthic community: *Benthic* means the bottom habitat of the ocean, and can mean anything as shallow as a salt marsh or the intertidal zone, to areas of the bottom that are several miles deep in the ocean. *Benthic community* refers to those organisms that live in and on the bottom. (A*In*@ meaning they live within the substrate; e.g, within the sand or mud found on the bottom. See *Benthic infauna*, below)

Benthic infauna: See *Benthic community*, above. Those organisms that live *in* the bottom sediments (sand, mud, gravel, etc.) of the ocean. As opposed to *benthic epifauna*, that live *on* the surface of the bottom sediments.

Benthivore: Usually refers to fish that feed on benthic or bottom dwelling organisms.

Berm: A narrow ledge typically at the top or bottom of a slope; e.g. a berm paralleling the shoreline caused by wave action on a sloping beach; also an elongated mound or wall of earth.

Biogenic habitats: Ocean habitats whose physical structure is created or produced by the animals themselves; e.g, coral reefs.

Biomass: The total mass of living matter in a given unit area or the weight of a fish stock or portion thereof. Biomass can be listed for beginning of year (Jan-1), Mid-Year, or mean (average during the entire year). In addition, biomass can be listed by age group (numbers at age * average weight at age) or summarized by groupings (e.g., age 1^+, ages 4+ 5, etc). See also spawning stock biomass, exploitable biomass, and mean biomass.

B_{MSY}: The stock biomass that would produce MSY when fished at a fishing mortality rate equal to F_{MSY}. For most stocks, B_{MSY} is about ½ of the carrying capacity. The proposed overfishing definition control rules call for action when biomass is below ¼ or ½ B_{MSY}, depending on the species.

$B_{threshold}$: 1) A limit reference point for biomass that defines an unacceptably low biomass i.e., puts a stock at high risk (recruitment failure, depensation, collapse, reduced long term yields, etc). 2) A biomass threshold that the SFA requires for defining when a stock is overfished. A stock is overfished if its biomass is below $B_{threshold}$. A determination of overfished triggers the SFA requirement for a rebuilding plan to achieve B_{target} as soon as possible, usually not to exceed 10 years except certain requirements are met. In Amendment 9 control rules, $B_{threshold}$ is often defined as either $1/2B_{MSY}$ or 1/4 B_{MSY}. $B_{threshold}$ is also known as $B_{minimum}$.

B_{target}: A desirable biomass to maintain fishery stocks. This is usually synonymous with B_{MSY} or its proxy.

Biomass weighted F: A measure of fishing mortality that is defined as an average of fishing mortality at age weighted by biomass at age for a ranges of ages within the stock (e.g., ages 1^+ biomass weighted F is a weighted average of the mortality for ages 1 and older, age 3^+ biomass weighted is a weighted average for ages 3 and older). Biomass weighted F can also be calculated using catch in weight over mean biomass. See also fully-recruited F.

Biota: All the plant and animal life of a particular region.

Bivalve: A class of mollusks having a soft body with platelike gills enclosed within two shells hinged together; e.g., clams, mussels.

Bottom roughness: The inequalities, ridges, or projections on the surface of the seabed that are caused by the presence of bedforms, sedimentary structures, sedimentary particles, excavations, attached and unattached organisms, or other objects; generally small scale features.

Bottom tending mobile gear: All fishing gear that operates on or near the ocean bottom that is actively worked in order to capture fish or other marine species. Some examples of bottom tending mobile gear are otter trawls and dredges.

Bottom tending static gear: All fishing gear that operates on or near the ocean bottom that I snot actively worked; instead, the effectiveness of this gear depends on species moving to the gear which is set in a particular manner by a vessel, and later retrieved. Some examples of bottom tending static gear are gillnets, traps, and pots.

Boulder reef: An elongated feature (a chain) of rocks (generally piled boulders) on the seabed.

Bryozoans: Phylum aquatic organisms, living for the most part in colonies of interconnected individuals. A few to many millions of these individuals may form one colony. Some bryozoans encrust rocky surfaces, shells, or algae others form lacy or fan-like colonies that in some regions may form an abundant

component of limestones. Bryozoan colonies range from millimeters to meters in size, but the individuals that make up the colonies are rarely larger than a millimeter. Colonies may be mistaken for hydroids, corals or seaweed.

Burrow: A hole or excavation in the sea floor made by an animal (as a crab, lobster, fish, burrowing anemone) for shelter and habitation.

Bycatch: (v.) the capture of nontarget species in directed fisheries which occurs because fishing gear and methods are not selective enough to catch only target species; (n.) fish which are harvested in a fishery but are not sold or kept for personal use, including economic discards and regulatory discards but not fish released alive under a recreational catch and release fishery management program.

Capacity: the level of output a fishing fleet is able to produce given specified conditions and constraints. Maximum fishing capacity results when all fishing capital is applied over the maximum amount of available (or permitted) fishing time, assuming that all variable inputs are utilized efficiently.

Catch: The sum total of fish killed in a fishery in a given period. Catch is given in either weight or number of fish and may include landings, unreported landings, discards, and incidental deaths.

Coarse sediment: Sediment generally of the sand and gravel classes; not sediment composed primarily of mud; but the meaning depends on the context, e.g. within the mud class, silt is coarser than clay.

Commensalism: See *Mutualism*. An interactive association of two species where one benefits in some way, while the other species is in no way affected by the association.

Continental shelf waters: The waters overlying the continental shelf, which extends seaward from the shoreline and deepens gradually to the point where the sea floor begins a slightly steeper descent to the deep ocean floor; the depth of the shelf edge varies, but is approximately 200 meters in many regions.

Control rule: A pre-determined method for determining fishing mortality rates based on the relationship of current stock biomass to a biomass target. Amendment 9 overfishing control rules define a target biomass (B_{MSY} or proxy) as a management objective. The biomass threshold ($B_{threshold}$ or B_{min}) defines a minimum biomass below which a stock is considered overfished.

Cohort: see yearclass.

Crustaceans: Invertebrates characterized by a hard outer shell and jointed appendages and bodies. They usually live in water and breathe through gills. Higher forms of this class include lobsters, shrimp and crawfish; lower forms include barnacles.

Diatoms: Small mobile plants (algæ) with silicified (silica, sand, quartz) skeletons. They are among the most abundant phytoplankton in cold waters, and an important part of the food chain.

Days absent: an estimate by port agents of trip length. This data was collected as part of the NMFS weighout system prior to May 1, 1994.

Days-at-sea (DAS): the total days, including steaming time that a boat spends at sea to fish.

Demersal species: Most often refers to fish that live on or near the ocean bottom. They are often called benthic fish, groundfish, or bottom fish.

Discards: animals returned to sea after being caught; see Bycatch (n.)

Dissolved nutrients: Non-solid nutrients found in a liquid.

Echinoderms: A member of the Phylum Echinodermata. Marine animals usually characterised by a five-fold symmetry, and possessing an internal skeleton of calcite plates, and a complex water vascular system. Includes echinoids (sea urchins), crinoids (sea lillies) and asteroids (starfish).

Ecosystem-based management: a management approach that takes major ecosystem components and services—both structural and functional—into account, often with a multispecies or habitat perspective

Egg stage: One of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that occurs after reproduction and refers to the developing embryo, its food store, and sometimes jelly or albumen, all surrounded by an outer shell or membrane. Occurs before the *larval* or *juvenile stage.*

Elasmobranch: Any of numerous fishes of the class Chondrichthyes characterized by a cartilaginous skeleton and placoid scales: sharks; rays; skates.

Embayment: A bay or an indentation in a coastline resembling a bay.

Emergent epifauna: See *Epifauna*. Animals living upon the bottom that extend a certain distance above the surface.

Epifauna: See *Benthic infauna. Epifauna* are animals that live on the surface of the substrate, and are often associated with surface structures such as rocks, shells, vegetation, or colonies of other animals.

Essential Fish Habitat (EFH): Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The EFH designation for most managed species in this region is based on a legal text definition and geographical area that are described in the Habitat Omnibus Amendment (1998).

Estuarine area: The area of an estuary and its margins; an area characterized by environments resulting from the mixing of river and sea water.

Estuary: A water passage where the tide meets a river current; especially an arm of the sea at the lower end of a river; characterized by an environment where the mixing of river and seawater causes marked variations in salinity and temperature in a relatively small area.

Eutrophication: A set of physical, chemical, and biological changes brought about when excessive nutrients are released into the water.

Euphotic zone: The zone in the water column where at least 1% of the incident light at the surface penetrates.

Exclusive Economic Zone (EEZ): a zone in which the inner boundary is a line coterminous with the seaward boundary of each of the coastal States and the outer boundary is line 200 miles away and parallel to the inner boundary

Exempt fisheries: Any fishery determined by the Regional Director to have less than 5 percent regulated species as a bycatch (by weight) of total catch according to 50 CFR ?648.80(a)(7).

Exploitable biomass: The biomass of fish in the portion of the population that is vulnerable to fishing.

Exploitation pattern: Describes the fishing mortality at age as a proportion of fully recruited F (full vulnerability to the fishery). Ages that are fully vulnerable experience 100% of the fully recruited F and are termed fully recruited. Ages that are only partially vulnerable experience a fraction of the fully recruited F and are termed partially recruited. Ages that are not vulnerable to the fishery (including discards) experience no mortality and are considered pre-recruits. Also known as the partial recruitment pattern, partial recruitment vector or fishery selectivity.

Exploitation rate (u): The fraction of fish in the exploitable population killed during the year by fishing. This is an annual rate compared to F, which is an instantaneous rate. For example, if a population has 1,000,000 fish large enough to be caught and 550,000 are caught (landed and discarded) then the exploitation rate is 55%.

Fathom: A measure of length, containing six feet; the space to which a man can extend his arms; used chiefly in measuring cables, cordage, and the depth of navigable water by soundings.

Fishing mortality (F): A measurement of the rate of removal of fish from a population caused by fishing. This is usually expressed as an instantaneous rate (F) and is the rate at which fish are harvested at any given point in a year. Instantaneous fishing mortality rates can be either fully recruited or biomass weighted. Fishing mortality can also be expressed as an exploitation rate (see exploitation rate) or less commonly, as a conditional rate of fishing mortality (m, fraction of fish removed during the year if no other competing sources of mortality occurred. Lower case m should not be confused with upper case M, the instantaneous rate of natural mortality).

$F_{0.1}$: a conservative fishing mortality rate calculated as the F associated with 10 percent of the slope at origin of the yield-per-recruit curve.

F_{MAX}: a fishing mortality rate that maximizes yield per recruit. F_{MAX} is less conservative than $F_{0.1}$.

F_{MSY}: a fishing mortality rate that would produce MSY when the stock biomass is sufficient for producing MSY on a continuing basis.

$F_{threshold}$: 1) The maximum fishing mortality rate allowed on a stock and used to define overfishing for status determination. Amendment 9 frequently uses F_{MSY} or F_{MSY} proxy for $F_{threshold.}$ 2) The maximum fishing mortality rate allowed for a given biomass as defined by a control rule.

Fishing effort: the amount of time and fishing power used to harvest fish. Fishing power is a function of gear size, boat size and horsepower.

Fluidized: When a normally non-fluid material is made to act like a fluid; e.g. gravity, shaking or injection of a fluid.

Framework adjustments: adjustments within a range of measures previously specified in a fishery management plan (FMP). A change usually can be made more quickly and easily by a framework adjustment than through an amendment. For plans developed by the New England Council, the procedure requires at least two Council meetings including at least one public hearing and an evaluation of environmental impacts not already analyzed as part of the FMP.

Furrow: A trench in the earth made by a plow; something that resembles the track of a plow, as a marked narrow depression; a groove with raised edges.

Glacial moraine: A sedimentary feature deposited from glacial ice; characteristically composed of unsorted clay, sand, and gravel. Moraines typically are hummocky or ridge-shaped and are located along the sides and at the fronts of glaciers.

Glacial till: Unsorted sediment (clay, sand, and gravel mixtures) deposited from glacial ice.

Grain size: the size of individual sediment particles that form a sediment deposit; particles are separated into size classes (e.g. very fine sand, fine sand, medium sand, among others); the classes are combined into broader categories of mud, sand, and gravel; a sediment deposit can be composed of few to many different grain sizes.

Growth overfishing: Fishing at an exploitation rate or at an age at entry that reduces potential yields from a cohort but does not reduce reproductive output (see recruitment overfishing).

Halocline: The zone of the ocean in which salinity increases rapidly with depth.

Habitat complexity: Describes or measures a habitat in terms of the variability of its characteristics and its functions, which can be biological, geological, or physical in nature. Refers to how complex the physical structure of the habitat is. A bottom habitat with *structure-forming organisms*, along with other three dimensional objects such as boulders, is more complex than a flat, featureless, bottom.

Highly migratory species: tuna species, marlin, oceanic sharks, sailfishes, and swordfish

Hydroids: Generally, animals of the Phylum Cnidaria, Class Hydrozoa; most hydroids are bush-like polyps growing on the bottom and feed on plankton, they reproduce asexually and sexually.

Immobile epifaunal species: See *epifauna*. Animals living on the surface of the bottom substrate that, for the most part, remain in one place.

Individual Fishing Quota (IFQ): federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by an individual person or entity

Juvenile stage: One of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that comes between the *egg* or *larval stage* and the *adult stage*; juveniles are considered immature in the sense that they are not yet capable of reproducing, yet they differ from the larval stage because they look like smaller versions of the adults.

Landings: The portion of the catch that is harvested for personal use or sold.

Land runoff: The part of precipitation, snowmelt, or irrigation water that reaches streams (and thence the sea) by flowing over the ground, or the portion of rain or snow that does not percolate into the ground and is discharged into streams instead.

Larvae stage: One of several marked phases or periods in the development and growth of many animals. The first stage of development after hatching from the *egg* for many fish and invertebrates. This life stage looks fundamentally different than the juvenile and adult stages, and is incapable of reproduction; it must undergo metamorphosis into the juvenile or adult shape or form.

Lethrinids: Fish of the genus *Lethrinus*, commonly called emperors or nor'west snapper, are found mainly in Australia's northern tropical waters. Distinctive features of Lethrinids include thick lips, robust canine teeth at the front of the jaws, molar-like teeth at the side of the jaws and cheeks without scales. Lethrinids are carnivorous bottom-feeding fish with large, strong jaws.

Limited-access permits: permits issued to vessels that met certain qualification criteria by a specified date (the "control date").

Lutjanids: Fish of the genus of the Lutjanidae: snappers. Marine; rarely estuarine. Some species do enter freshwater for feeding. Tropical and subtropical: Atlantic, Indian and Pacific Oceans.

Macrobenthos: See *Benthic community* and *Benthic infauna*. Benthic organisms whose shortest dimension is greater than or equal to 0.5 mm.

Maturity ogive: A mathematical model used to describe the proportion mature at age for the entire population. A_{50} is the age where 50% of the fish are mature.

Mean biomass: The average number of fish within an age group alive during a year multiplied by average weight at age of that age group. The average number of fish during the year is a function of starting stock size and mortality rate occurring during the year. Mean biomass can be aggregated over several ages to describe mean biomass for the stock. For example the mean biomass summed for ages 1 and over is the 1^+ mean biomass; mean biomass summed across ages 3 and over is 3^+ mean biomass.

Megafaunal species: The component of the fauna of a region that comprises the larger animals, sometimes defined as those weighing more than 100 pounds.

Mesh selectivity ogive: A mathematical model used to describe the selectivity of a mesh size (proportion of fish at a specific length retained by mesh) for the entire population. L_{25} is the length where 25% of the fish encountered are retained by the mesh. L_{50} is the length where 50% of the fish encountered are retained by the mesh.

Meter: A measure of length, equal to 39.37 English inches, the standard of linear measure in the metric system of weights and measures. It was intended to be, and is very nearly, the ten millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of a meridian.

Metric ton: A unit of weight equal to a thousand kilograms (1kgs = 2.2 lbs.). A metric ton is equivalent to 2,205 lbs. A thousand metric tons is equivalent to 2.2 million lbs.

Microalgal: Small microscopic types of algae such as the green algae.

Microbial: Microbial means of or relating to microorganisms.

Minimum spawning stock threshold: the minimum spawning stock size (or biomass) below which there is a significantly lower chance that the stock will produce enough new fish to sustain itself over the long term.

Mobile organisms: organisms that are not confined or attached to one area or place, that can move on their own, are capable of movement, or are moved (often passively) by the action of the physical environment (waves, currents, etc.).

Molluscs: Common term for animals of the phylum Mollusca. Includes groups such as the bivalves (mussels, oysters etc.), cephalopods (squid, octopus etc.) and gastropods (abalone, snails). Over 80,000 species in total with fossils back to the Cambrian period.

Mortality: see Annual total mortality (A), Exploitation rate (u), Fishing mortality (F), Natural mortality (M), and instantaneous total mortality (Z).

Motile: Capable of self-propelled movement. A term that is sometimes used to distinguish between certain types of organisms found in water.

Multispecies: the group of species managed under the Northeast Multispecies Fishery Management Plan. This group includes whiting, red hake and ocean pout plus the regulated species (cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish).

Mutualism: See *Commensalism*. A symbiotic interaction between two species in which both derive some benefit.

Natural disturbance: A change caused by natural processes; e.g. in the case of the seabed, changes can be caused by the removal or deposition of sediment by currents; such natural processes can be common or rare at a particular site.

Natural mortality: A measurement of the rate of death from all causes other than fishing such as predation, disease, starvation, and pollution. Commonly expressed as an instantaneous rate (M). The rate of natural mortality varies from species to species, but is assumed to be M=0.2 for the five critical stocks. The natural mortality rate can also be expressed as a conditional rate (termed n and not additive with competing sources of mortality such as fishing) or as annual expectation of natural death (termed v and additive with other annual expectations of death).

Nearshore area: The area extending outward an indefinite but usually short distance from shore; an area commonly affected by tides and tidal and storm currents, and shoreline processes.

Nematodes: a group of elongated, cylindrical worms belonging to the phylum Nematoidea, also called thread-worms or eel-worms. Some non-marine species attack roots or leaves of plants, others are parasites on animals or insects.

Nemerteans: Proboscis worms belonging to the phylum Nemertea, and are soft unsegmented marine worms that have a threadlike proboscis and the ability to stretch and contract.

Nemipterids: Fishes of the Family Nemipteridae, the threadfin breams or whiptail breams. Distribution: Tropical and sub-tropical Indo-West Pacific.

Northeast Shelf Ecosystem: The Northeast U.S. Shelf Ecosystem has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream.

Northwest Atlantic Analysis Area (NAAA): A spatial area developed for analysis purposes only. The boundaries of this the area are within the 500 fathom line to the east, the coastline to the west, the Hague line to the north, and the North Carolina/ South Carolina border to the south. The area is approximately 83,550 square nautical miles, and is used as the denominator in the EFH analysis to determine the percent of sediment, EFH, and biomass contained in an area, as compared to the total NAAA.

Nutrient budgets: An accounting of nutrient inputs to and production by a defined ecosystem (e.g., salt marsh, estuary) versus utilization within and export from the ecosystem.

Observer: any person required or authorized to be carried on a vessel for conservation and management purposes by regulations or permits under this Act

Oligochaetes: See *Polychaetes*. Oligochaetes are worms in the phylum Annelida having bristles borne singly along the length of the body.

Open access: describes a fishery or permit for which there is no qualification criteria to participate. Open-access permits may be issued with restrictions on fishing (for example, the type of gear that may be used or the amount of fish that may be caught).

Opportunistic species: Species that colonize disturbed or polluted sediments. These species are often small, grow rapidly, have short life spans, and produce many offspr ing.

Optimum Yield (OY): the amount of fish which A) will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery

Organic matter: Material of, relating to, or derived from living organisms.

Overfished: A conditioned defined when stock biomass is below minimum biomass threshold and the probability of successful spawning production is low.

Overfishing: A level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis.

Peat bank: A bank feature composed of partially carbonized, decomposed vegetable tissue formed by partial decomposition of various plants in water; may occur along shorelines.

Pelagic gear: Mobile or static fishing gear that is not fixed, and is used within the water column, not on the ocean bottom. Some examples are mid-water trawls and pelagic longlines.

Phytoplankton: Microscopic marine plants (mostly algae and diatoms) which are responsible for most of the photosynthetic activity in the oceans.

Piscivore: A species feeding preferably on fish.

Planktivore: An animal that feeds on plankton.

Polychaetes: Polychaetes are segmented worms in the phylum Annelida. Polychaetes (poly-chaetae = many-setae) differ from other annelids in having many setae (small bristles held in tight bundles) on each segment.

Porosity: The amount of free space in a volume of a material; e.g. the space that is filled by water between sediment particles in a cubic centimeter of seabed sediment.

Possession-limit-only permit: an open-access permit (see above) that restricts the amount of multispecies a vessel may retain (currently 500 pounds of "regulated species").

Pre-recruits: Fish in size or age groups that are not vulnerable to the fishery (including discards).

Prey availability: The availability or accessibility of prey (food) to a predator. Important for growth and survival.

Primary production: The synthesis of organic materials from inorganic substances by photosynthesis.

Recovery time: The period of time required for something (e.g. a habitat) to achieve its former state after being disturbed.

Recruitment: the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in one year would be the recruitment to the fishery. "Recruitment" also refers to new year classes entering the population (prior to recruiting to the fishery).

Recruitment overfishing: fishing at an exploitation rate that reduces the population biomass to a point where recruitment is substantially reduced.

Regulated groundfish species: cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish. These species are usually targeted with large-mesh net gear.

Relative exploitation: an index of exploitation derived by dividing landings by trawl survey biomass. This measure does not provide an absolute magnitude of exploitation but allows for general statements about trends in exploitation.

Retrospective pattern: A pattern of systematic over-estimation or underestimation of terminal year estimates of stock size, biomass or fishing mortality compared to that estimate for that same year when it occurs in pre-terminal years.

Riverine area: The area of a river and its banks.

Saurids: Fish of the family Scomberesocidae, the sauries or needlefishes. Distribution: tropical and temperate waters.

Scavenging species: An animal that consumes dead organic material.

Sea whips: A coral that forms long flexible structures with few or no branches and is common on Atlantic reefs.

Sea pens: An animal related to corals and sea anemones with a featherlike form.

Sediment: Material deposited by water, wind, or glaciers.

Sediment suspension: The process by which sediments are suspended in water as a result of disturbance.

Sedentary: See *Motile* and *Mobile organisms*. Not moving. Organisms that spend the majority of their lives in one place.

Sedimentary bedforms: Wave-like structures of sediment characterized by crests and troughs that are formed on the seabed or land surface by the erosion, transport, and deposition of particles by water and wind currents; e.g. ripples, dunes.

Sedimentary structures: Structures of sediment formed on the seabed or land surface by the erosion, transport, and deposition of particles by water and wind currents; e.g. ripples, dunes, buildups around boulders, among others.

Sediment types: Major combinations of sediment grain sizes that form a sediment deposit, e.g. mud, sand, gravel, sandy gravel, muddy sand, among others.

Spawning adult stage: See *adult stage*. Adults that are currently producing or depositing eggs.

Spawning stock biomass (SSB): the total weight of fish in a stock that sexually mature, i.e., are old enough to reproduce.

Species assemblage: Several species occurring together in a particular location or region

Species composition: A term relating the relative abundance of one species to another using a common measurement; the proportion (percentage) of various species in relation to the total on a given area.

Species diversity: The number of different species in an area and their relative abundance

Species richness: See *Species diversity*. A measurement or expression of the number of species present in an area; the more species present, the higher the degree of species richness.

Species with vulnerable EFH: If a species was determined to be "highly" or "moderately" vulnerable to bottom tending gears (otter trawls, scallop dredges, or clam dredges) then it was included in the list of species with vulnerable EFH. Currently there are 23 species and life stages that are considered to have vulnerable EFH for this analysis.

Status Determination: A determination of stock status relative to $B_{threshold}$ (defines overfished) and $F_{threshold}$ (defines overfishing). A determination of either overfished or overfishing triggers a SFA requirement for rebuilding plan (overfished), ending overfishing (overfishing) or both.

Stock: A grouping of fish usually based on genetic relationship, geographic distribution and movement patterns. A region may have more than one stock of a species (for example, Gulf of Maine cod and Georges Bank cod). A species, subspecies, geographical grouping, or other category of fish capable of management as a unit.

Stock assessment: determining the number (abundance/biomass) and status (life-history characteristics, including age distribution, natural mortality rate, age at maturity, fecundity as a function of age) of individuals in a stock

Structure-forming organisms: Organisms, such as corals, colonial bryozoans, hydroids, sponges, mussel beds, oyster beds, and seagrass that by their presence create a three-dimensional physical structure on the bottom. See *biogenic habitats*.

Submerged aquatic vegetation: Rooted aquatic vegetation, such as seagrasses, that cannot withstand excessive drying and therefore live with their leaves at or below the water surface in shallow areas of estuaries where light can penetrate to the bottom sediments. SAV provides an important habitat for young fish and other aquatic organisms.

Surficial sediment: Sediment forming the sea floor or land surface; thickness of the surficial layer may vary.

Surplus production: Production of new stock biomass defined by recruitment plus somatic growth minus biomass loss due to natural deaths. The rate of surplus production is directly proportional to stock biomass and its relative distance from the maximum stock size at carrying capacity (K). B_{MSY} is often defined as the biomass that maximizes surplus production rate.

Surplus production models: A family of analytical models used to describe stock dynamics based on catch in weight and CPUE time series (fishery dependent or survey) to construct stock biomass history. These models do not require catch at age information. Model outputs may include stock biomass history, biomass weighted fishing mortality rates, MSY, F_{MSY}, B_{MSY}, K, (maximum population biomass where stock growth and natural deaths are balanced) and r (intrinsic rate of increase).

Survival rate (S): Rate of survival expressed as the fraction of a cohort surviving the a period compared to number alive at the beginning of the period (# survivors at the end of the year / numbers alive at the beginning of the year). Pessimists convert survival rates into annual total mortality rate using the relationship A=1-S.

Survival ratio (R/SSB): an index of the survivability from egg to age-of-recruitment. Declining ratios suggest that the survival rate from egg to age-of-recruitment is declining.

TAC: Total allowable catch. This value is calculated by applying a target fishing mortality rate to exploitable biomass.

Taxa: The plural of taxon. Taxon is a named group or organisms of any rank, such as a particular species, family, or class.

Ten-minute- "squares" of latitude and longitude (TMS): Are a measure of geographic space. The actual size of a ten-minute-square varies depending on where it is on the surface of the earth, but in general each square is approximately 70-80 square nautical miles in this region. This is the spatial area that EFH designations, biomass data, and some of the effort data have been binned into for analysis purposes in various sections of this document.

Topography: The depiction of the shape and elevation of land and sea floor surfaces.

Total mortality: The rate of mortality from all sources (fishing, natural, pollution) Total mortality can be expressed as an instantaneous rate (called Z and equal to F + M) or Annual rate (called A and calculated as the ratio of total deaths in a year divided by number alive at the beginning of the year)

Trophic guild: Trophic is defined as the feeding level within a system that an organism occupies; e.g., predator, herbivore. A guild is defined as a group of species that exploit the same class of environmental resources in a similar way. The trophic guild is a utilitarian concept covering both structure and organization that exists between the structural categories of trophic groups and species.

Turbidity: Relative water clarity; a measurement of the extent to which light passing through water is reduced due to suspended materials.

Two-bin (displacement) model: a model used to estimate the effects of area closures. This model assumes that effort from the closed areas (first bin) is displaced to the open areas (second bin). The total effort in the system is then applied to the landings-per-unit-effort (LPUE) in open areas to obtain a projected catch. The percent reduction in catch is calculated as a net result.

Vulnerability: In order to evaluate the potential adverse effects of fishing on EFH, the vulnerability of each species EFH was determined. This analysis defines vulnerability as the likelihood that the functional value of EFH would be adversely affected as a result of fishing with different gear types. A number of criteria were considered in the evaluation of the vulnerability of EFH for each life stage including factors like the function of habitat for shelter, food and/or reproduction.

Yield-per-recruit (YPR): the expected yield (weight) of individual fish calculated for a given fishing mortality rate and exploitation pattern and incorporating the growth characteristics and natural mortality.

Yearclass: also called cohort. Fish that were spawned in the same year. By convention, the "birth date" is set to January 1st and a fish must experience a summer before turning 1. For example, winter flounder that were spawned in February-April 1997 are all part of the 1997 cohort (or year-class). They would be considered age 0 in 1997, age 1 in 1998, etc. A summer flounder spawned in October 1997 would have its birth date set to the following January 1 and would be considered age 0 in 1998, age 1 in 1999, etc.

Z: instantaneous rate of total mortality. The components of Z are additive (i.e., Z = F+M)

Zooplankton: See *Phytoplankton*. Small, often microscopic animals that drift in currents. They feed on detritus, phytoplankton, and other zooplankton. They are preyed upon by fish, shellfish, whales, and other zooplankton.

8.3 Table of Acronyms

The table of acronyms can be found after the table of contents.

8.4 List of Public Meetings

Amendment 13 issues were discussed at the following meetings.

	Meeting Type	Meeting Location	Meeting Dates
2000	Council Meeting	Tavern on Harbor, Gloucester	3/22/2000
	Council Meeting	Providence Biltmore, PVD, RI	5/3 & 5/4/2000
	Council Meeting	Sheraton, Portsmouth, NH	6/14 & 6/15/2000
	Council Meeting	DoubleTree Hotel, Portland, ME	7/26 & 7/27/2000
	Council Meeting	Seaport Inn, Fairhaven, MA	9/25 - 9/27/2000
	Council Meeting	Tavern on Harbor, Gloucester	11/6 - 11/8/2000
	Amendment 13 Info Mtg	Gloucester Seafood Display	4/27/2000
	Amendment 13 Info Mtg	Mass Maritime, Buzzards Bay	5/11/2000
	Amendment 13 Info Mtg	Rockland Middle School, ME	5/18/2000
	Amendment 13 Info Mtg	Radisson Hotel, New London, CT	5/25/2000
	Amendment 13 Info Mtg	Fish Family Asst Ctr, New Bedford	6/1/2000
	Amendment 13 Info Mtg	Gloucester, MA	6/2/2000
	Oversight Committee	Holiday Inn, Peabody, MA	1/14/2000
	Oversight Committee	Yokens Ctr, Portsmouth, NH	3/15/2000
	Oversight Committee	Holiday Inn, Mansfield, MA	4/11/2000
	Oversight Committee/Advisory Panel	Sheraton Ferncroft, Danvers	2/16/2000
	Oversight Committee/Advisory Panel	Sheraton Colonial, Wakefield, MA	5/1 & 5/2/2000
	Oversight Committee/Advisory Panel	York Harbor Inn, York, ME	5/9/2000
	Oversight Committee/Advisory Panel	Holiday Inn, Peabody, MA	5/22/2000
	Oversight Committee/Advisory Panel	Howard Johnson's, Portsmouth, NH	6/13/2000
	Oversight Committee/Advisory Panel	Radisson Hotel, New London, CT	6/20/2000
	Oversight Committee/Advisory Panel	Trade Winds, Rockland, ME	7/6/2000
	Oversight Committee/Advisory Panel	Sheraton Ferncroft, Danvers	7/13/2000
	Oversight Committee/Advisory Panel	Seaport Inn, Fairhaven, MA	7/19/2000
	Advisory Panel	Holiday Inn, Peabody, MA	1/13/2000
	Advisory Panel	Sheraton Airport, Warwick, RI	6/27/2000
	PDT	NEFMC, Newburyport, MA	8/3/2000
	PDT	NEFSC, Woods Hole, MA	9/25/2000
	PDT	NEFSC, Woods Hole, MA	10/18/2000
	PDT	Aquarium Library, Woods Hole, MA	12/7/2000
	PDT	NEFSC, Woods Hole, MA	12/14/2000
	Social Impact Informational Meeting (Public Hearing)	Seafood Display Auction, Gloucester	11/1/2000
	Social Impact Informational Meeting (Public Hearing)	Eldridge Library, Chatham, MA	11/2/2000
	Social Impact Informational Meeting (Public Hearing)	Portsmouth, NH	11/6/2000
	Social Impact Informational Meeting (Public Hearing)	Family Asst Ctr., New Bedford, MA	11/8/2000
	Social Impact Informational Meeting (Public Hearing)	Narragansett Town Hall, RI	11/9/2000
	Social Impact Informational Meeting (Public Hearing)	Casco Bay Terminal, Portland, ME	11/13/2000
	Social Impact Informational Meeting (Public Hearing)	Ramada Inn, Riverhead, NY	11/21/2000
	Social Impact Informational Meeting (Public Hearing)	Holiday Inn, Ellsworth, ME	12/7/2000
	Social Impact Informational Meeting (Public Hearing)	VFW, Scituate, MA	12/7/2000

	Meeting Type	Meeting Location	Meeting Dates
2001	Council Meeting	Sheraton Ferncroft, Danvers	1/23 - 11/25/2001
	Council Meeting	Radisson, New London, CT	3/14 & 3/15/2001
	Council Meeting	Holiday Inn, Peabody, MA	5/2 & 5/3/2001
	Council Meeting	Providence Biltmore, RI	6/13 & 6/14/2001
	Oversight Committee	Sheraton Ferncroft, Danvers	1/17/2001
	Oversight Committee	Holiday Inn, Peabody, MA	2/6/2001
	Oversight Committee	Holiday Inn, Peabody, MA	2/27 & 2/28/2001
	Oversight Committee	DoubleTree Hotel, Portland, ME	6/4/2001
	Oversight Committee/Advisory Panel	Sheraton Ferncroft, Danvers	4/16/2001
	Advisory Panel	Holiday Inn, Peabody, MA	2/22/2001
	Groundfish and Capacity – Oversight Committee/Advisory Panel/PDT	Providence Biltmore, RI	6/12/2001
	PDT	NEFSC, Woods Hole, MA	1/11/2001
	PDT	Rossi's, Newburyport, MA	2/15/2001
	PDT	NEFMC, Newburyport, MA	2/21/2001
	PDT	DMF, Pocasset, MA	3/8/2001
	PDT	NEFSC, Woods Hole, MA	4/10/2001
	PDT	John Carver Inn, Plymouth, MA	5/8/2001
	PDT	DMF, Pocasset, MA	5/24/2001
	PDT/MMC	Rossi's, Newburyport, MA	8/28/2001
	PDT	NEFMC, Newburyport, MA	11/13/2001
	PDT	NEFSC, Woods Hole, MA	12/3/2001
2002	Council Meeting	Marriott Courtyard, Portsmouth NH	1/15-1/17/2002
	Council Meeting	Hilton, Mystic CT	3/19-3/20/2002
	Council Meeting	Sheraton Ferncroft Hotel, Danvers MA	5/16/2002
	Council Meeting	Samoset Resort, Rockport ME	6/24-6/26/2002
	Council Meeting	Providence Biltmore, Prov. RI	9/10-9/12/2002
	Council Meeting	Gloucester High School, MA	11/5-11/7
	Oversight Committee	Sheraton Colonial, Wakefield, MA	1/25/2002
	Oversight Committee	Holiday Inn, Mansfield, MA	2/22/2002
	Oversight Committee	Holiday Inn, Peabody, MA	3/27/2002
	Oversight Committee	Radisson Hotel, New London, CT	4/9/2002
	Oversight Committee	Holiday Inn, Mansfield, MA	4/23 & 4/24/2002
	Oversight Committee	Holiday Inn, Peabody, MA	4/30/2002
	Oversight Committee	DoubleTree Hotel, Portland, ME	5/7 & 5/8/2002
	Oversight Committee	Sheraton Colonial, Wakefield, MA	7/8/2002
	Oversight Committee	Holiday Inn, Portsmouth, NH	10/30/2002
	Oversight Committee	Holiday Inn, Mansfield, MA	12/2/2002
	Advisory Panel	Sheraton Ferncroft, Danvers, MA	5/31/2002
	Recreational Advisory Panel	Holiday Inn, Peabody, MA	4/26/2002
	Recreational Advisory Panel	Holiday Inn, Peabody, MA	6/18/2002
	PDT	NEFSC, Woods Hole, MA	2/7/2002
	PDT	NEFMC, Newburyport, MA	3/7/2002
	PDT	NEFMC, Newburyport, MA	4/15/2002
	PDT	NEFSC, Woods Hole, MA	5/29/2002
	PDT	Rossi's, Newburyport, MA	6/18/2002
	PDT	NEFSC, Woods Hole, MA	7/10/2002
	PDT	NEFMC, Newburyport, MA	9/18/2002
	PDT	NEFSC, Woods Hole, MA	10/16/2002
	Council Meeting	Courtyard by Marriott, Portsmouth, NH	1/28-1/30/2003
2003	Council Meeting	Providence Biltmore, Providence, RI	3/4-3/6/2003
	Council Meeting	Sheraton Ferncroft Hotel, Danvers, MA	4/15/2003
	Council Meeting	Tavern on the Harbor, Gloucester, MA	5/20-5/22/2003

	Meeting Type	Meeting Location	Meeting Dates
	Council Meeting	Holiday Inn, Portsmouth, NH	7/15-7/17/2003
	Oversight Committee	Holiday Inn, Mansfield, MA	1/22/2003
	Oversight Committee	Providence Biltmore, Providence, RI	3/3/2003
	Oversight Committee	Sheraton Colonial, Wakefield, MA	4/8/2003
	Oversight Committee	Holiday Inn, Peabody, MA	7/9-7/10/2003
	Advisory Panel	Holiday Inn, Peabody, MA	7/8/2003
	PDT	NEFMC, Newburyport, MA	1/17/2003
	PDT	NEFSC, Woods Hole, MA	2/25/2003
	PDT	Holiday Inn, Mansfield, MA	3/20/2003
	PDT	Holiday Inn, Mansfield, MA	4/23/2003
	Council	Tavern on the Harbor, Gloucester, MA	5/20-5/22/2003
	Council	Holiday Inn, Portland, ME	7/15-7/17/2003
	Public Hearing	Tom's River, NH	9/09/2003
	Public Hearing	Riverhead, NY	9/10/2003
	Public Hearing	South Kingstown, Ri	9/11/2003
	Public Hearing	Hyannis, MA	9/15/2003
	Public Hearing	Gloucester, MA	9/22/2003
	Public Hearing	Portsmouth, NH	9/23/2003
	Public Hearing	Ellsworth, ME	9/24/2003
	Public Hearing	Portland, ME	9/25/2003
	Public Hearing	Fairhaven, MA	9/30/2003
	Council	Holiday Inn, Peabody MA	10/21/2003
	Council	Holiday Inn, Peabody MA	11/4 – 11/6/2003

8.5 Index

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FINAL

Amendment 13

To the

Northeast Multispecies Fishery Management Plan

VOLUME II
Affected Environment

Prepared by the
New England Fishery Management Council
National Marine Fisheries Service

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9.0 Description of the Resource and the Affected Environment

A full description of the affected environment was prepared for the Environmental Assessment (EA) that accompanied Amendment 11 to the Northeast Multispecies Fishery Management Plan, Amendment 9 to the Atlantic Sea Scallop Fishery Management Plan, Amendment 1 to the Monkfish FMP, Amendment 1 to the Atlantic Salmon FMP and Sections of the Atlantic Herring FMP (NEFMC 1998a) (heretofore referred to as the "Omnibus EFH Amendment"). This Amendment also contained essential fish habitat (EFH) designations for all groundfish species managed by the New England Fishery Management Council (NEFMC). Amendment 9 to the Northeast Multispecies FMP (NEFMC 1998b) added halibut to the list of managed groundfish stocks; information for this species was updated in the accompanying Environmental Assessment (EA).

The description of the affected environment is presented to provide sufficient background information on the various resources and entities likely to be affected by the actions proposed or under consideration in the SEIS. While there has been little change in the biological or physical components of the environment since the implementation of the Omnibus EFH Amendment, other than changes in stock status that are summarized in Section 9.2.1.1, several reports have since been published which add to our understanding of the physical and biological environment of this region. Although this section deals with the *affected* environment, it does not present the effects of the proposed management program.

9.1 Physical Environment

This section contains a description of the physical environment of the Northeast multispecies fishery, including oceanographic and physical habitat conditions in the Gulf of Maine – Georges Bank region and the area south of New England. Some of the information presented in this section was originally included in the EA for the Omnibus EFH Amendment (NEFMC 1998a).

9.1.1 Physical Characteristics of Regional Systems

The Northeast Shelf Ecosystem (Figure 220) has been described as including the area from the Gulf of Maine south to North Carolina, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream (Sherman et al. 1996). The continental slope of this region includes the area east of the shelf, out to a depth of 2000 m. A number of distinct sub-systems comprise the region, including the Gulf of Maine, Georges Bank, the Mid-Atlantic Bight, and the continental slope. Occasionally another subsystem, Southern New England, is described; however, we incorporated the distinctive features of this region into the descriptions of Georges Bank and the Mid-Atlantic Bight.

The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern edge. It is characterized by highly productive, well-mixed waters and strong currents. The Mid-Atlantic Bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, NC. The continental slope begins at the continental shelf break and continues eastward with increasing depth until it becomes the continental rise. It is fairly homogenous, with exceptions at the shelf break, some of the canyons, the Hudson Shelf Valley and in areas of glacially rafted hard bottom. Pertinent aspects of the physical characteristics of each of these systems are described in sections that follow. This review is based on several summary reviews (Abernathy 1989, Backus 1987, Beardsley et al. 1996, Brooks 1996, Cook 1988, Dorsey 1998, Kelley 1998, Wiebe et al. 1987, Mountain 1994, NEFMC 1998, Schmitz et al. 1987, Sherman et al. 1996, Steimle et al. 1999b, Stumpf and Biggs 1988, Townsend 1992, Tucholke 1987). Literature citations are not included for generally accepted concepts; however, new research and specific results of research findings are cited.

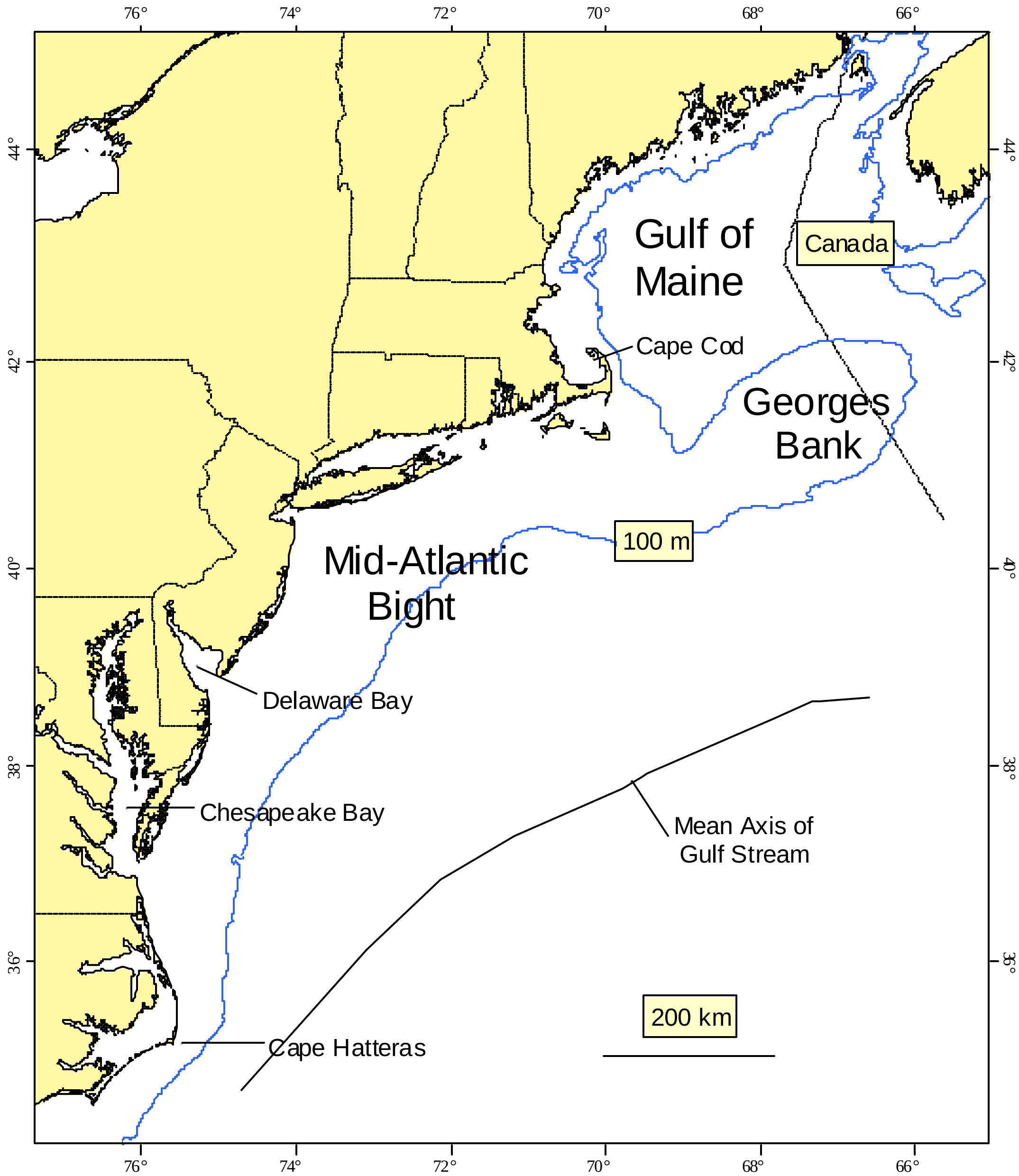


Figure 220 - U.S. Northeast shelf ecosystem.

9.1.1.1 Gulf of Maine

Although not obvious in appearance, the Gulf of Maine is actually an enclosed coastal sea, bounded on the east by Browns Bank, on the north by the Nova Scotian (Scotian) Shelf, on the west by the New England states and on the south by Cape Cod and Georges Bank (Figure 220). The Gulf of Maine (GOM) was glacially derived, and is characterized by a system of deep basins, moraines and rocky protrusions with limited access to the open ocean. This geomorphology influences complex oceanographic processes which result in a rich biological community.

The Gulf of Maine is topographically unlike any other part of the continental border along the U.S. east coast. It contains 21 distinct basins separated by ridges, banks, and swells. The three largest basins are Wilkinson, Georges, and Jordan (Figure 220). Depths in the basins exceed 250 m, with a maximum depth of 350 m in Georges Basin, just north of Georges Bank. The Northeast Channel between Georges Bank and Browns Bank, leads into Georges Basin, and is one of the primary avenues for exchange of water between the GOM and the North Atlantic Ocean.

High points within the gulf include irregular ridges, such as Cashes Ledge, which peaks at 9 m below the surface, as well as lower flat-topped banks and gentle swells. Some of these rises are remnants of the sedimentary shelf left after the glaciers removed most of it. Others are glacial moraines and a few, like Cashes Ledge, are out-croppings of bedrock. Very fine sediment particles created and eroded by the glaciers have collected in thick deposits over much of the Gulf of Maine, particularly in its deep basins (Figure 221**)**. These mud deposits blanket and obscure the irregularities of the underlying bedrock, forming topographically smooth terrains. Some shallower basins are covered with mud as well, including some in coastal waters. In the rises between the basins, other materials are usually at the surface. Unsorted glacial till covers some morainal areas, as on Sewell Ridge to the north of Georges Basin and on Truxton Swell to the south of Jordan Basin. Sand predominates on some high areas and gravel, sometimes with boulders, predominates on others.

Coastal sediments exhibit a high degree of small-scale variability. Bedrock is the predominant substrate along the western edge of the Gulf of Maine north of Cape Cod in a narrow band out to a depth of about 60 m. Rocky areas become less common with increasing depth, but some rock outcrops poke through the mud covering the deeper sea floor. Mud is the second most common substrate on the inner continental shelf. Mud predominates in coastal valleys and basins that often border abruptly on rocky substrates. Many of these basins extend without interruption into deeper water. Gravel, often mixed with shell, is common adjacent to bedrock outcrops and in fractures in the rock. Large expanses of gravel are not common, but do occur near reworked glacial moraines and in areas where the seabed has been scoured by bottom currents. Gravel is most abundant at depths of 20-40 m, except in eastern Maine where a gravel-covered plain exists to depths of at least 100 m. Bottom currents are stronger in eastern Maine where the mean tidal range exceeds 5 m. Sandy areas are relatively rare along the inner shelf of the western Gulf of Maine, but are more common south of Casco Bay, especially offshore of sandy beaches.

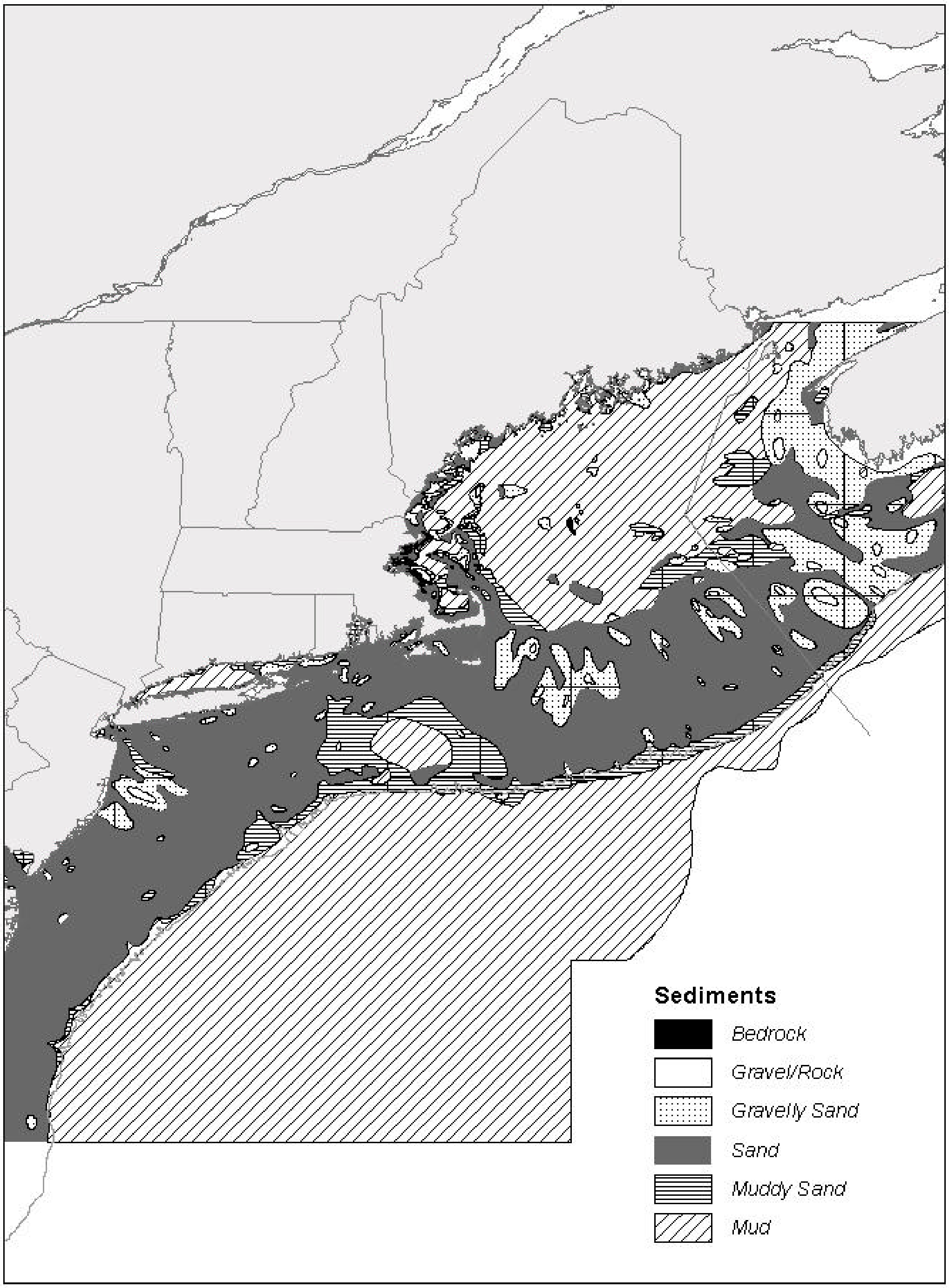


Figure 221- Map showing distribution of surficial sediments, Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight (modified from original map by Poppe *et al.* 1989).

An intense seasonal cycle of winter cooling and turnover, springtime freshwater runoff, and summer warming influences oceanographic and biologic processes in the Gulf of Maine. The Gulf has a general counterclockwise nontidal surface current that flows around its coastal margin. It is primarily driven by fresh, cold Scotian Shelf water that enters over the Scotian Shelf and through the Northeast Channel, and freshwater river runoff, which is particularly important in the spring. Dense relatively warm and saline slope water entering through the bottom of the Northeast Channel from the continental slope also influences gyre formation. Counterclockwise gyres generally form in Jordan, Wilkinson, and Georges Basins and the Northeast Channel as well. These surface gyres are more pronounced in spring and summer; with winter, they weaken and become more influenced by the wind.

Stratification of surface waters during spring and summer seals off a mid-depth layer of water that preserves winter salinity and temperatures. This cold layer of water is called "Maine intermediate water" (MIW) and is located between more saline Maine bottom water and the warmer, stratified Maine surface water. The stratified surface layer is most pronounced in the deep portions of the western GOM. Tidal mixing of shallow areas prevents thermal stratification and results in thermal fronts between the stratified areas and cooler mixed areas. Typically, mixed areas include Georges Bank, the southwest Scotian Shelf, eastern Maine coastal waters, and the narrow coastal band surrounding the remainder of the Gulf.
The Northeast Channel provides an exit for cold MIW and outgoing surface water while it allows warmer more saline slope water to move in along the bottom and spill into the deeper basins. The influx of water occurs in pulses, and appears to be seasonal, with lower flow in late winter and a maximum in early summer.

Gulf of Maine circulation and water properties can vary significantly from year to year. Notable episodic events include shelf-slope interactions such as the entrainment of shelf water by Gulf Stream rings (see *Gulf Stream and Associated Features*), and strong winds that can create currents as high as 1.1 meters/second over Georges Bank. Warm core Gulf Stream rings can also influence upwelling and nutrient exchange on the Scotian shelf, and affect the water masses entering the GOM. Annual and seasonal inflow variations also affect water circulation.

Internal waves are episodic and can greatly affect the biological properties of certain habitats. Internal waves can shift water layers vertically, so that habitats normally surrounded by cold MIW are temporarily bathed in warm, organic-rich surface water. On Cashes Ledge, it is thought that deeper nutrient rich water is driven into the photic zone, providing for increased productivity. Localized areas of upwelling interaction occur in numerous places throughout the Gulf.

9.1.1.2 Georges Bank

Georges Bank is a shallow (3-150 m depth), elongate (161 km wide by 322 km long) extension of the continental shelf which was formed by the Wisconsinian glacial episode and is characterized by a steep slope on its northern edge and a broad, flat, gently sloping southern flank. The Great South Channel lies to the west. Natural processes continue to erode and rework the sediments on Georges Bank. It is anticipated that erosion and reworking of sediments will reduce the amount of sand available to the sand sheets, and cause an overall coarsening of the bottom sediments (Valentine et al. 1993).

Glacial retreat during the late Pleistocene deposited the bottom sediments currently observed on the eastern section of Georges Bank, and the sediments have been continuously reworked and redistributed by the action of rising sea level, and by tidal, storm and other currents. The strong, erosive currents affect the character of the biological community. Bottom topography on eastern Georges Bank is characterized by linear ridges in the western shoal areas; a relatively smooth, gently dipping sea floor on the deeper, easternmost part; a highly energetic peak in the north with sand ridges up to 30 m high and extensive gravel pavement, and steeper and smoother topography incised by submarine canyons on the southeastern margin (see *Continental Slope* for more on canyons). The nature of the seabed sediments varies widely, ranging from clay to gravel (Figure 221). The gravel-sand mixture is usually a transition zone between coarse gravel and finer sediments.

The central region of the bank is shallow; shoals and troughs characterize the bottom, with sand dunes superimposed upon them. The two most prominent elevations on the ridge and trough area are Cultivator and Georges Shoals. This shoal and trough area is a region of strong currents, with average flood and ebb tidal currents greater than 4 km per hour, and as high as 7 km per hour. The dunes migrate at variable rates, and the ridges may move, also. In an area that lies between the central part and northeast peak, Almeida et al. (2000) identified high energy areas as between 35 – 65 m deep, where sand is transported on a daily basis by tidal currents; and a low energy area at depths > 65 m that is affected only by storm currents. The area west of the Great South Channel, known as Nantucket shoals (Figure 220), is similar in nature to the central region of the bank. Currents in these areas are strongest where water depth is shallower than 50 m. This type of traveling dune and swale morphology is also found in the mid-Atlantic bight.

The Great South Channel separates the main part of Georges Bank from Nantucket Shoals. Sediments in this region include gravel pavement and mounds, some scattered boulders, sand with storm generated ripples, scattered shell and mussel beds. Tidal and storm currents may range from moderate to strong, depending upon location and storm activity (Valentine, pers. comm.).

Oceanographic frontal systems occur between water masses from the Gulf of Maine and Georges Bank. These water masses differ in temperature, salinity, nutrient concentration, and planktonic communities, which influence productivity and may influence fish abundance and distribution. Currents on Georges Bank include a weak, persistent clockwise gyre around the bank, a strong semidiurnal tidal flow predominantly northwest and southeast, and very strong, intermittent storm-induced currents, which can all occur simultaneously. Tidal currents over the shallow top of Georges Bank can be very strong, and keep the waters over the bank well mixed vertically. This results in a tidal front that separates the cool waters of the well-mixed shallows of the central bank from the warmer, seasonally stratified shelf waters on the seaward and shoreward sides of the bank. The clockwise gyre is instrumental in distribution of the planktonic community, including larval fish. For example, Lough and Potter (1993) describe passive drift of Atlantic cod and haddock eggs and larvae in a southwest residual pattern around Georges Bank. Larval concentrations are found at varying depths along the southern edge between 60 – 100 m.

9.1.1.3 Mid Atlantic Bight

The Mid-Atlantic Bight includes the shelf and slope waters from Georges Bank south to Cape Hatteras, and east to the Gulf Stream (Figure 220). Like the rest of the continental shelf, the topography of the Mid-Atlantic Bight was shaped largely by sea level fluctuations caused by past ice ages. The shelf's basic morphology and sediments derive from the retreat of the last ice sheet, and the subsequent rise in sea level. Since that time, currents and waves have modified this basic structure.

Shelf and slope waters of the Mid-Atlantic Bight have a slow southwestward flow that is occasionally interrupted by warm core rings or meanders from the Gulf Stream. On average, shelf water moves parallel to bathymetry isobars at speeds of 5-10 cm/second at the surface and 2 cm/second or less at the bottom. Storm events can cause much more energetic variations in flow. Tidal currents on the inner shelf have a higher flow rate of 20 cm/second that increases to 100 cm/second near inlets.

Slope water tends to be warmer than shelf water because of its proximity to the Gulf Stream, and also tends to be more saline. The abrupt gradient where these two water masses meet is called the shelf-slope front. This front is usually located at the edge of the shelf and touches bottom at about 75-100 m depth of water, and then slopes up to the east toward the surface. It reaches surface waters approximately 25-55 km further offshore. The position of the front is highly variable, and can be influenced by many physical factors. Vertical structure of temperature and salinity within the front can develop complex patterns because of the interleaving of shelf and slope waters – for example cold shelf waters can protrude offshore, or warmer slope water can intrude up onto the shelf.

The seasonal effects of warming and cooling increase in shallower, near shore waters. Stratification of the water column occurs over the shelf and the top layer of slope water during the spring-summer and is usually established by early June. Fall mixing results in homogenous shelf and upper slope waters by October in most years. A permanent thermocline exists in slope waters from 200-600 m. Temperatures decrease at the rate of about 0.02º C per meter and remain relatively constant except for occasional incursions of Gulf stream eddies or meanders. Below 600 m, temperature declines, and usually averages about 2.2º C at 4000 m. A warm, mixed layer approximately 40 m thick resides above the permanent thermocline.

The "cold pool" is an annual phenomenon particularly important to the Mid-Atlantic Bight. It stretches from the Gulf of Maine along the outer edge of Georges Bank and then southwest to Cape Hatteras. It becomes identifiable with the onset of thermal stratification in the spring and lasts into early fall until normal seasonal mixing occurs. It usually exists along the bottom between the 40 m and 100 m isobaths and extends up into the water column for about 35 m, to the bottom of the seasonal thermocline. The cold pool usually represents about 30% of the volume of shelf water. Minimum temperatures for the cold pool occur in early spring and summer, and range from 1.1º C to 4.7º C.

The shelf slopes gently from shore out to between 100 and 200 km offshore where it transforms to the slope (100 – 200 m water depth) at the shelf break. In both the Mid-Atlantic and on Georges Bank, numerous canyons incise the slope, and some cut up onto the shelf itself (see section on *Continental Slope*). The primary morphological features of the shelf include shelf valleys and channels, shoalmassifs, scarps, and sand ridges and swales (Figure 222, Figure 223).

Most of these structures are relic except for some sand ridges and smaller sand-formed features. Shelf valleys and slope canyons were formed by rivers of melted glacier that deposited sediments on the outer shelf edge as they entered the ocean. Most valleys cut about 10 m into the shelf, with the exception of the Hudson Shelf Valley, which is about 35 m deep. The valleys were partially filled as the glacier melted and egressed across the shelf. The glacier also left behind a lengthy scarp near the shelf break from Chesapeake Bay north to the eastern end of Long Island. Shoal retreat massifs were produced by extensive deposition at a cape or estuary mouth. Massifs were also formed as estuaries retreated across the shelf.

The sediment type covering most of the shelf in the Mid-Atlantic Bight is sand, with some relatively small, localized areas of gravel and gravelly sand (Figure 221). On the slope, muddy sand and mud predominate. Sediments are fairly uniformly distributed over the shelf in this region. A sheet of sand and gravel varying in thickness from 0 to 10 m covers most of the shelf. The mean bottom flow from the constant southwesterly current is not fast enough to move sand, so sediment transport must be episodic. Net sediment movement is in the same southwesterly direction as the current. The sands are mostly medium to coarse grains, with finer sand in the Hudson Shelf Valley and on the outer shelf. Mud is rare over most of the shelf, but is common in the Hudson Shelf Valley. Occasionally relic estuarine mud deposits are re-exposed in the swales between sand ridges. Fine sediment content increases rapidly at the shelf break, which is sometimes called the "mud line," and sediments are 70-100% fines on the slope.

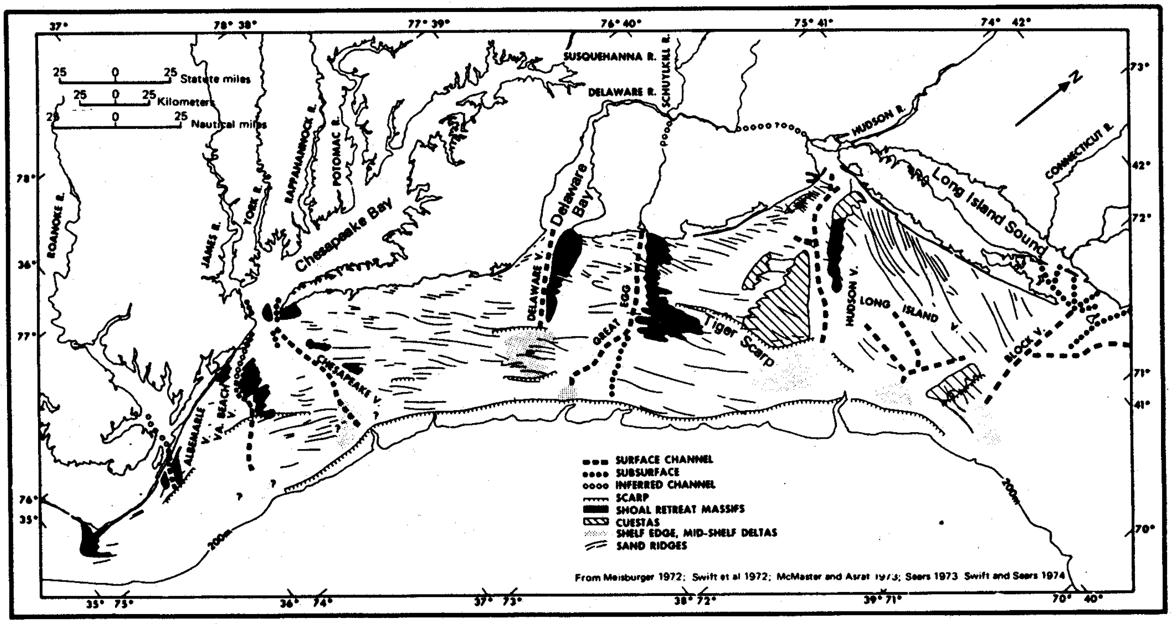


Figure 222 - Mid-Atlantic Bight submarine morphology. Source: Stumpf and Biggs (1988).

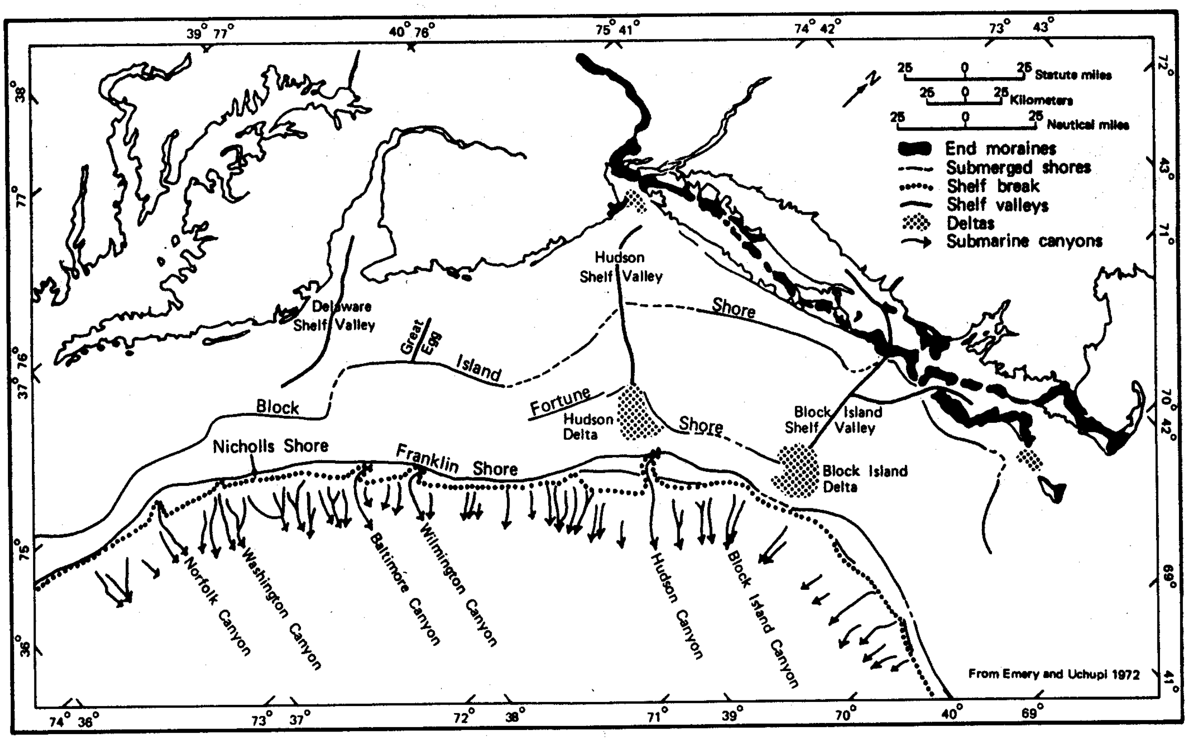


Figure 223 - Major features of the Mid-Atlantic and Southern New England continental shelf. Source: Stumpf and Biggs (1988).

In addition to sand ridges that were formed by the glaciers, some sand ridges have been formed since the end of the last ice age. Their formation is not well understood; however, they appear to develop from the sediments that erode from the shore face. They maintain their shape, so it is assumed that they are in equilibrium with modern current and storm regimes. They are usually grouped, with heights of about 10 m, lengths of 10-50 km and spacing of 2 km. Ridges are usually oriented at a slight angle towards shore, running in length from northeast to southwest. The seaward face usually has the steepest slope. Sand ridges are often covered with smaller similar forms such as sand waves, megaripples, and ripples. Swales occur between sand ridges. Since ridges are higher than the adjacent swales, they are exposed to more energy from water currents, and experience more sediment mobility than swales. Ridges tend to contain less fine sand, silt and clay while relatively sheltered swales contain more of the finer particles. Swales have greater benthic macrofaunal density, species richness and biomass, due in part to the increased abundance of detrital food and the physically less rigorous conditions.

Sand waves are usually found in patches of 5-10 with heights of about 2 m, lengths of 50-100 m and 1-2 km between patches. Sand waves are primarily found on the inner shelf, and often observed on sides of sand ridges. They may remain intact over several seasons. Megaripples occur on sand waves or separately on the inner or central shelf. During the winter storm season, they may cover as much as 15% of the inner shelf. They tend to form in large patches and usually have lengths of 3-5 m with heights of 0.5-1 m. Megaripples tend to survive for less than a season. They can form during a storm and reshape the upper 50-100 cm of the sediments within a few hours. Ripples are also found everywhere on the shelf, and appear or disappear within hours or days, depending upon storms and currents. Ripples usually have lengths of about 1-150 cm and heights of a few centimeters.

The northern portion of the mid-Atlantic bight is sometimes referred to as southern New England. Some of the features of this area were described earlier (see *Georges Bank*); however, one other formation of this region that deserves note is the “mud patch” which is located just southwest of Nantucket Shoals and southeast of Long Island. Tidal currents in this area slow significantly, which allows silts and clays to settle out. The mud is mixed with sand, and is occasionally re-suspended by large storms. This habitat is an anomaly of the outer continental shelf.

Artificial reefs are another significant mid-Atlantic habitat, formed much more recently on the geologic time-scale than other regional habitat types. These localized areas of hard structure have been formed by shipwrecks, lost cargoes, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle and Zetlin 2000). While some of materials have been deposited specifically for use as fish habitat, most have an alternative primary purpose; however, they have all become an integral part of the coastal and shelf ecosystem. It is expected that the increase in these materials has had an impact on living marine resources and fisheries, but these effects are not well known. In general, reefs are important for attachment sites, shelter, and food for many species, and fish predators such as tunas may be attracted by prey aggregations, or may be behaviorally attracted to the reef structure.

9.1.1.4 Continental Slope

The continental slope extends from the continental shelf break, at depths between 60 m and 200 m, eastward to a depth of 2000 m. The width of the slope varies from 10-50 km, with an average gradient of 3-6°; however, local gradients can be nearly vertical. The base of the slope is defined by a marked decrease in seafloor gradient where the continental rise begins.

The morphology of the present continental slope appears largely to be a result of sedimentary processes that occurred during the Pleistocene, including:

1) slope upbuilding and progradation by deltaic sedimentation principally during sea-level low-stands;
2) canyon-cutting by sediment mass movements during and following sea-level low-stands;
3) sediment slumping.

The slope is cut by at least 70 large canyons between Georges Bank and Cape Hatteras (Figure 224) and numerous smaller canyons and gullies, many of which may feed into the larger canyon systems. The New England Seamount Chain including Bear, Mytilus, Balanus, etc. occurs on the slope southwest of Georges Bank. A smaller chain (Caryn, Knauss, etc.) occurs in the vicinity in deeper water.

A "mud line" occurs on the slope at a depth of 250 m – 300 m, below which fine silt and clay-size particles predominate (Figure 221). Localized coarse sediments and rock outcrops are found in and near canyon walls, and occasional boulders occur on the slope as a result of glacial rafting. Sand pockets may also be formed as a result of downslope movements.

Gravity induced downslope movement is the dominant sedimentary process on the slope, and includes slumps, slides, debris flows, and turbidity currents, in order from thick cohesive movement to relatively non-viscous flow. Slumps are localized blocks of sediment that may involve short downslope movement. However, turbidity currents can transport sediments thousands of kilometers.

Submarine canyons are not spaced evenly along the slope, but tend to decrease in areas of increasing slope gradient. Canyons are typically "v"-shaped in cross section and often have steep walls and outcroppings of bedrock and clay. The canyons are continuous from the canyon heads to the base of the continental slope. Some canyons end at the base of the slope, but others continue as channels onto the continental rise. Larger and more deeply incised canyons are generally significantly older than smaller ones, and there is also evidence that some older canyons have experienced several episodes of filling and re-excavation. Many, if not all, submarine canyons may first form by mass-wasting processes on the continental slope, although there is evidence that some canyons formed as a result of fluvial drainage (i.e., Hudson Canyon).

Canyons can alter the physical processes in the surrounding slope waters. Fluctuations in the velocities of the surface and internal tides can be large near the heads of the canyons, leading to enhanced mixing and sediment transport in the area. Shepard et al. (1979) concluded that the strong turbidity currents initiated in study canyons were responsible for enough sediment erosion and transport to maintain and modify those canyons. Since surface and internal tides are ubiquitous over the continental shelf and slope, it can be anticipated that these fluctuations are important for sedimentation processes in other canyons as well. In Lydonia Canyon, Butman et al. (1982) found that the dominant source of low-frequency current variability was related to passage of warm core Gulf Stream rings rather than the atmospheric events that predominate on the shelf.

The water masses of the Atlantic continental slope and rise are essentially the same as those of the North American Basin (defined in Wright and Worthington 1970). Worthington (1976) divided the water column of the slope into three vertical layers: deep water (colder than 4°C), the thermocline (4°-17°C), and warm water (warmer than 17°C). In the North American Basin the deep water accounts for two-thirds of all the water, the thermocline for about one quarter, and the warm water the remainder. In the slope water north of Cape Hatteras, the only warm water occurs in the Gulf Stream and seasonally influenced summer waters.

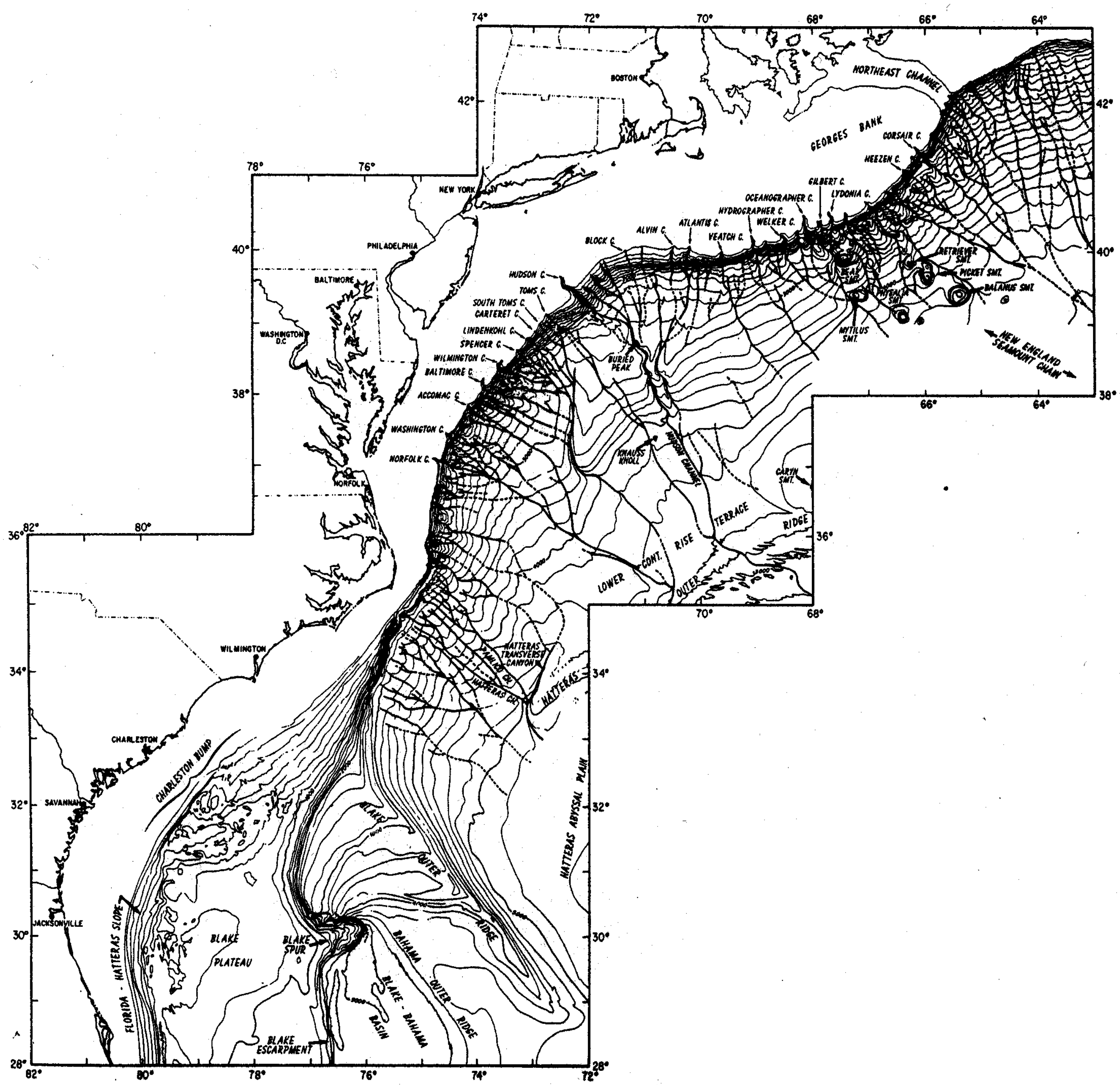


Figure 224 - Bathymetry of the U.S. Atlantic continental margin. Contour interval is 200 m below 1000 m water depth and 100 m above 1000 m. Axes of principal canyons and channels are shown by solid lines (dashed where uncertain or approximate). Source: Tucholke (1987).

The principal cold-water mass in the region is the North Atlantic Deep Water. North Atlantic Deep Water is comprised of a mixture of five sources: Antarctic Bottom Water, Labrador Sea Water, Mediterranean Water, Denmark Strait Overflow Water, and Iceland-Scotland Overflow Water. The thermocline represents a fairly straightforward water mass compared with either the deep water or the surface water. Nearly 90% of all thermocline water comes from the water mass called the Western North Atlantic Water. This water mass is slightly less saline northeast of Cape Hatteras due to the influx of southward flowing Labrador Coastal Water.

Seasonal variability in slope waters penetrates only the upper 200 m of the water column. In the winter months, cold temperatures and storm activity create a well-mixed layer down to about 100-150 m, but summer warming creates a seasonal thermocline overlain by a surface layer of low-density water. The seasonal thermocline, in combination with reduced storm activity in the summer, inhibits vertical mixing and reduces the upward transfer of nutrients into the photic zone.

Two currents found on the slope, the Gulf Stream and Western Boundary Undercurrent, together represent one of the strongest low frequency horizontal flow systems in the world. Both currents have an important influence on slope waters. Warm and cold core rings that spin off the Gulf Stream are a persistent and ubiquitous feature of the Northwest Atlantic Ocean (see section on *Gulf Stream*). The Western Boundary Undercurrent flows to the southwest along the lower slope and continental rise in a stream about 50 km wide. The boundary current is associated with the spread of North Atlantic Deep Water, and it forms part of the generally westward flow found in slope water. North of Cape Hatteras it crosses under the Gulf Stream in a manner not yet completely understood.

9.1.1.5 Gulf Stream and Associated Features

Shelf and slope waters of the Northeast are intermittently but intensely affected by the Gulf Stream. The Gulf Stream begins in the Gulf of Mexico and flows northeastward at an approximate rate of 1 m/second (2 knots), transporting warm waters north along the eastern coast of the United States, and then east towards the British Isles. Conditions and flow of the Gulf Stream are highly variable on time scales ranging from days to seasons. The principal sources of variability in slope waters off the northeastern shelf are intrusions from the Gulf Stream.

The location of the Gulf Stream's shoreward, western boundary is variable because of meanders and eddies. Gulf Stream eddies are formed when extended meanders enclose a parcel of seawater and pinch off. These eddies can be cyclonic, meaning they rotate counterclockwise and have a cold-core formed by enclosed slope water (cold core ring), or anticyclonic, meaning they rotate clockwise and have a warm core of Sargasso Sea water (warm core ring). The rings are shaped like a funnel, wider at the top and narrower at the bottom, and can have depths of over 2000 m. They range in size from approximately 150-230 m in diameter. There are 35% more rings and meanders in the vicinity of Georges Bank than in the Mid-Atlantic region. A net transfer of water on and off the shelf may result from the interaction of rings and shelf waters. These warm or cold core rings maintain their identity for several months until they are reabsorbed by the Gulf Stream. The rings and the Gulf Stream itself have a great influence over oceanographic conditions all along the continental shelf.

9.1.1.6 Coastal Features

Coastal and estuarine features such as salt marshes, mud flats, rocky intertidal zones, sand beaches, and submerged aquatic vegetation are critical to inshore and offshore habitats and fishery resources of the Northeast. For example, coastal areas and estuaries are important for nutrient recycling and primary production, and certain features serve as nursery areas for juvenile stages of economically important species. Salt marshes are found extensively throughout the region. Tidal and subtidal mud and sand flats are general salt marsh features and are also occur in other estuarine areas. Salt marshes provide nursery and spawning habitat for many finfish and shellfish species. Salt marsh vegetation can also be a large source of organic material that is important to the biological and chemical processes of the estuarine and marine environment.

Rocky intertidal zones are periodically submerged, high-energy environments found in the northern portion of the Northeast system. Sessile invertebrates and some fish inhabit rocky intertidal zones. A variety of algae, kelp, and rockweed are also important habitat features of rocky shores. Fishery resources may depend upon particular habitat features of the rocky intertidal that provide important levels of refuge and food.

Sandy beaches are most extensive along the Northeast coast. Different zones of the beach present suitable habitat conditions for a variety of marine and terrestrial organisms. For example, the intertidal zone presents suitable habitat conditions for many invertebrates, and transient fish find suitable conditions for foraging during high tide. Several invertebrate and fish species are adapted for living in the high-energy subtidal zone adjacent to sandy beaches.

9.1.1.7 Recent Oceanographic Conditions

The broad-scale hydrography of the Gulf of Maine – Georges Bank region is strongly influenced by variation in the major water mass fluxes into the Gulf of Maine. The two key sources of inflows to the Gulf of Maine are Scotian Shelf water, which is relatively cool and fresh, and slope water, which is relatively warm and more saline. The volume ratio of Scotian Shelf water to slope water was roughly 1:2 during the 1980s, while during the 1990s, the volume ratio has been roughly 2:1 (Pers. Comm. Dr. David Mountain, Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543). As a result of these broad-scale changes in inputs, water salinity has been lower in the Gulf of Maine during the 1990s.

Changes in the relative salinity of the Gulf of Maine have been indexed by salinity anomalies on the northwest flank of Georges Bank during 1975-2001. The observed salinity anomaly index shows cyclic variation on a 3-5 year time scale. During the 1990s, the salinity anomaly index has been low. In particular, salinity was very low during the 1996-1999 period. Since 1999, the salinity index has returned to normal levels. Based on some recent research, it appears that when salinity is low during autumn, chlorophyll levels in the subsequent spring tend to be higher than average, indicating higher primary production in the Gulf of Maine. Whether this higher primary production funnels upward through the food web to improve growth of commercially-exploited fishes is not known, however.

During 1998, there was an unusual influx of Labrador slope water (LSW) into the Gulf of Maine (Pers. Comm. Dr. David Mountain, Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543). The event began in January and was detectable through the autumn of 1998. Labrador slope water is cooler and fresher than the “normal” water mass of slope water that flows into the Gulf. Thus, the influx of LSW reduced water temperatures, on average, in 1998. This event was also notable because it was the first time since the 1960s that a LSW mass was observed in the Gulf of Maine. The unusual influx of LSW likely corresponds to a delayed response of local ocean conditions to the dramatic change in the North Atlantic Oscillation Index, a broad-scale measure of winter atmospheric pressure, during 1995-1996.

Interestingly, recruitment of several groundfish stocks in the Gulf of Maine was above recent average levels in 1998. In particular, the 1998 year classes of white hake, American plaice, witch flounder, and Gulf of Maine cod were larger than might be expected given recent low levels of recruitment. In addition, the 1998 and 1999 year classes of Georges Bank haddock were large in comparison to recent levels. Overall, it appears that the LSW event of 1998 may have had a positive effect on larval survival of several groundfish stocks, as measured by recruitment estimates taken from stock assessments.

9.2 Biological Environment

This section contains a description of the biological environment of the Northeast multispecies fishery, including biological habitat conditions in the Gulf of Maine – Georges Bank region and the area south of New England. Some of the information presented in this section was originally included in the EA for the Omnibus EFH Amendment (NEFMC 1998a).

Fish pass through a gamut of process and conditions throughout their life histories. The probability of successfully surviving and reproducing subsequent generations varies from species to species and for individuals of a species. One of the main values of habitat lies in the provision of adequate food for all metabolic considerations of fish, ultimately for both individual and population growth. Habitat can also provide refugia from predation, aggregation of prey for more effective feeding (i.e., minimized foraging costs), aggregation of individuals to enhance spawning, shelter from extreme physio-chemical events, adequate physio-chemical environment (e.g., oxygen production, detritus conversion, etc.), cycling of nutrients into "packaged" forms amenable for propagation up through the food web, etc. Thus, available habitat can improve the probabilities of successful survival and reproduction of fish.

Additionally, the degree of habitat complexity and utilization can mitigate some of the effects of predatory losses of fishes, particularly for juvenile stages. However, competition is another major biological consideration facing fish that is difficult to directly demonstrate in marine ecosystems. Knowing patterns of shared prey use (e.g., diet similarities) and spatio-temporal overlap can provide some insight into the potential competitors of a given fish species. Other biotic concerns such as parasitism, commensalim, or mutualism are recognized as factors but are effectively infeasible to assess on the broad oceanographic and fish community scales at which fish are typically sampled.

Below is a compilation of the general biological setting or "environment" within which many of the fish that are the principal subject of this document are found. This mosaic of biota is not intended to provide conclusive specific details regarding ecological processes that effect a particular fish species or life stage, rather a general background of the biological community surrounding these fish.

9.2.1 Description of the Species

The management unit is described in Amendments 7 and 9 to the FMP. No changes are proposed. Life history and habitat characteristics of the stocks managed in this FMP can be found in the Essential Fish Habitat Source documents (series) published as NOAA Technical Memorandums and available at http://www.nefsc.noaa.gov/nefsc/habitat/efh/.

9.2.1.1 Stock Status

Since implementation of Amendment 5 in 1994, the management program has succeeded in increasing the biomass of most groundfish stocks and, in general, reduced fishing mortality on most stocks. Estimated biomass tripled from 1995 to 2001, as shown in Figure 225 for twelve stocks with biomass estimates. While overall biomass has increased rapidly, some stocks – such as GB cod, SNE/MA yellowtail flounder, and CC/GOM yellowtail flounder – have only shown gradual improvement. Progress has also been made in controlling fishing mortality for many stocks. Fishing mortality for Gulf of Maine cod has been reduced in half since 1990, plaice mortality has been held nearly constant, and CC/GOM yellowtail flounder mortality has been reduced by about one-fourth. More dramtic success is obvious on Georges Bank, where the mortality of all key stocks has declined significantly since 1990. In the Southern New England area, winter flounder mortality has been cut in half while that of yellowtail flounder has been reduced by about a third (Figure 226).

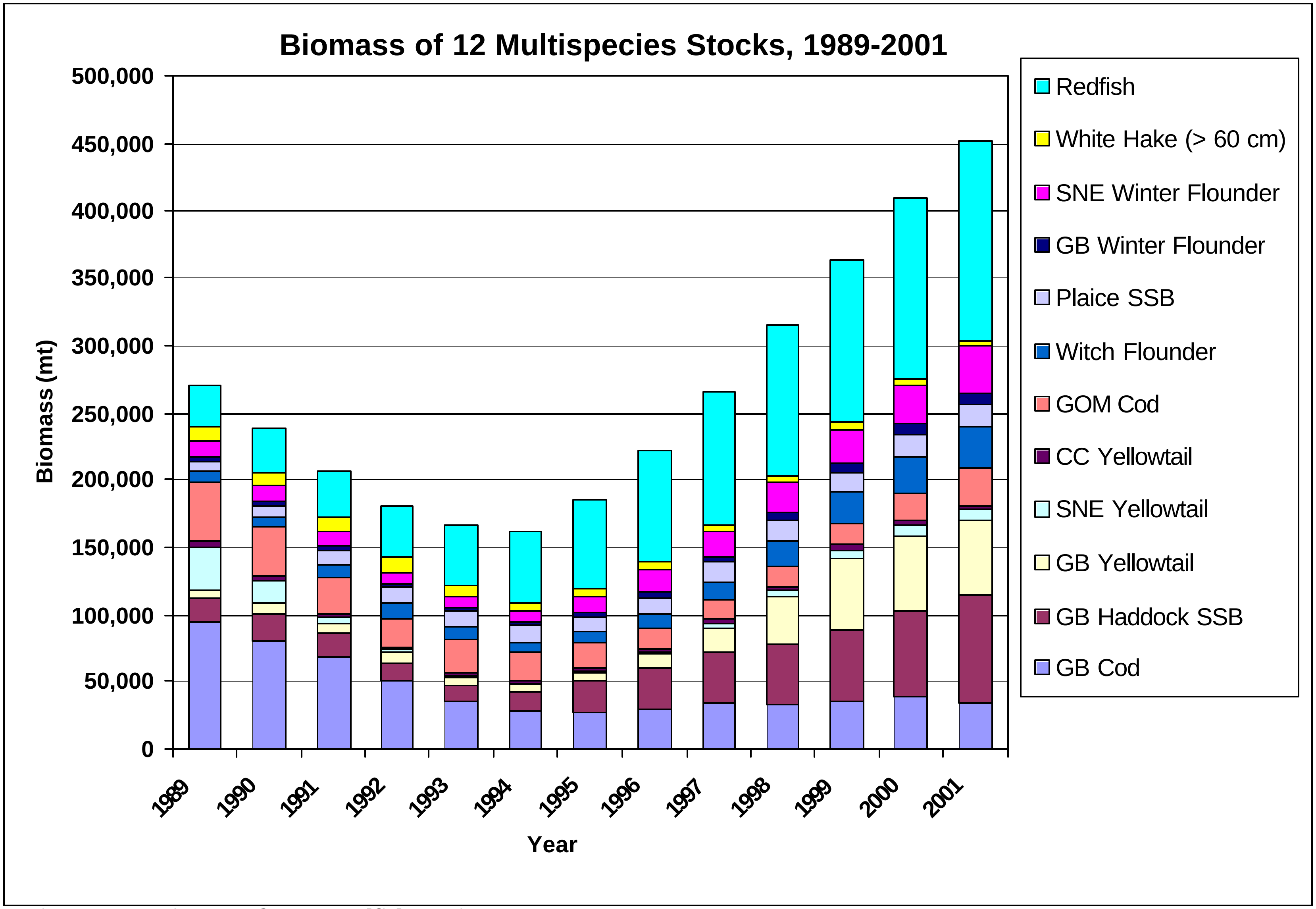


Figure 225 – Biomass of 12 groundfish species, 1989 – 2001

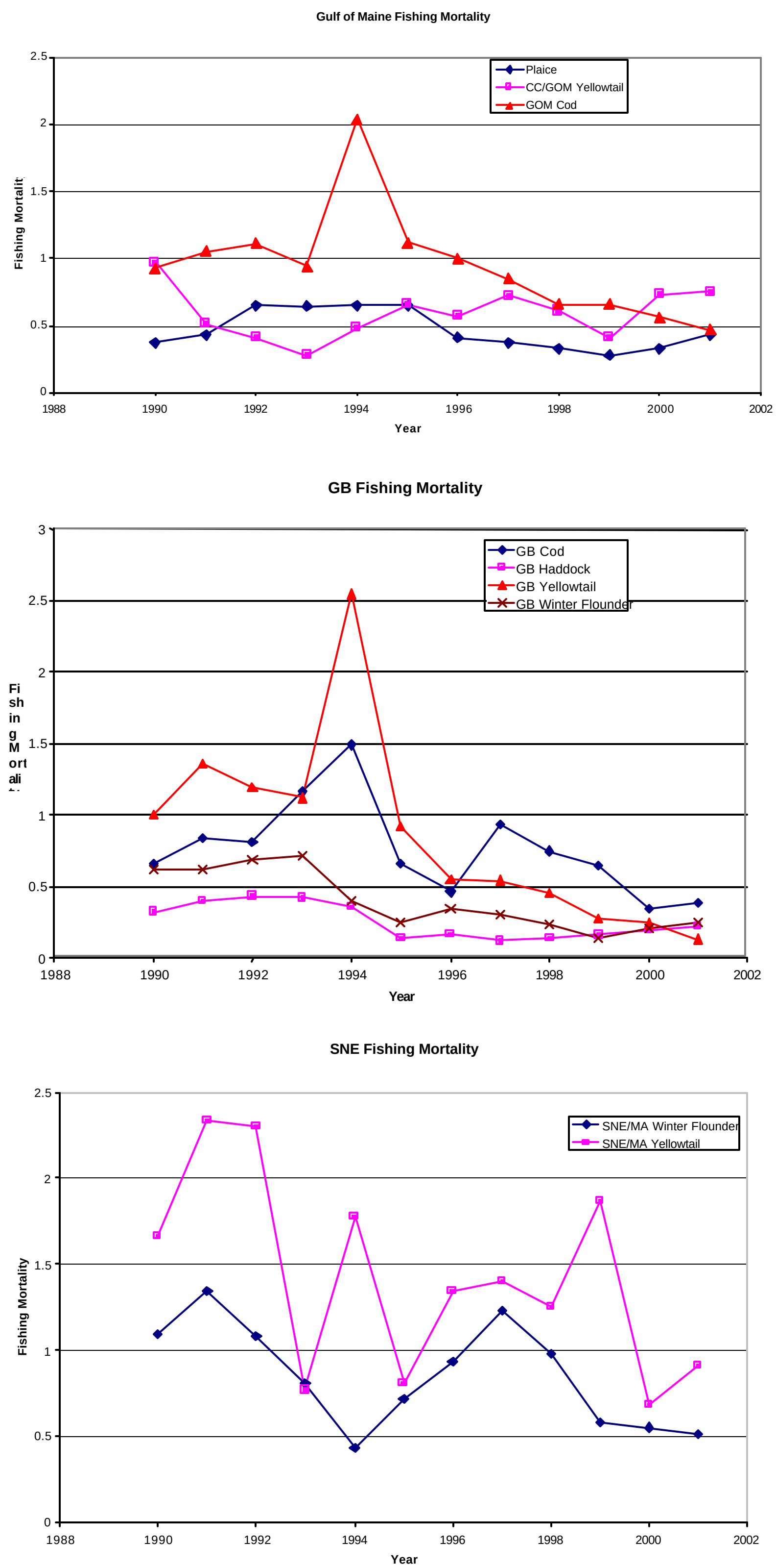


Figure 226 – Trends in fishing mortality by area

In terms of stock determinations – whether a stock is overfished or overfishing is occurring – there have also been improvements since 1996. In 1996, only one groundfish stock was not overfished, and overfishing was not occurring on only six stocks (Figure 227). Based on projected estimates of mortality and biomass provided by the Northeast Fisheries Science Center, in 2002 eight stocks were not overfished and overfishing was not occurring on ten stocks. The number of stocks that were both overfished and overfishing was occuring dropped from eleven in 1996 to six in 2002. In 1996, fishing mortality on eight stocks was more than twice F_{MSY}, while by 2002 only three stocks were subject to fishing mortality rates that were twice this threshold. The overall complex has not only seen an increase in biomass, but has experienced a decline in fishing mortality.

While increasing biomass and declining fishing mortality reflect improvements in stock conditions, the M-S Act requires that action be taken based on current conditions. This amendment is based on regulated groundfish stock status through calendar year 2001. The primary sources are the report of the Groundfish Assessment Review Meeting (GARM) (NEFSC 2002b), SAW 36 (NEFSC 2003a) and SAW 37 (NEFSC 2003b). The GARM updated assessments for all groundfish stocks. Groundfish assessments are usually prepared by the Stock Assessment Workshop (SAW) and reviewed by the Stock Assessment Review Committee (SARC). Assessments focus on individual stocks with a gap of several years common between updates. Georges Bank cod, haddock, and yellowtail flounder are assessed annually by the Trans-boundary Resource Assessment Committee (TRAC) which is prepared by NEFSC scientists to provide information to managers. On an annual basis, the Council's Multi-Species Monitoring Committee compiles available assessment information, conducts projections if necessary to estimate stock status between assessment cycles, and reports to the Council on the status of all groundfish stocks. The GARM report published in October 2002 supercedes the information from previous assesments and the MSM. SAW 36 updated the assessment for SNE/MA winter flounder and included assessments for Cape Cod/Gulf of Maine yellowtail flounder, SNE/MA winter flounder, and GOM winter flounder.

In the spring of 2002, the *Final Report of the Working Group on re-Evaluation of Biological Reference Points for New England Groundfish* (NEFSC 2002a) was prepared. While the focus of this working group was to re-estimate B_{MSY} and F_{MSY}, the group also estimated biomass and fishing mortality for groundfish stocks through calendar year 2001. This was done through projecting forward stock status based on the 2001 landings for age-based stocks, rather than through updating assessment models. Survey indices were examined and exploitation rates calculated for index –based stocks. There are differences between stock conditions reported by the working group and the GARM. The most significant are for SNE/MA yellowtail flounder, plaice, SNE/MA winter flounder, and witch flounder. The GARM determined that significant mortality reductions are necessary for these stocks, while the Working Group report concluded that only minor reductions were necessary. In addition, the GARM determined that pollock was not overfished and that plaice was overfished, while the Working Group concluded the opposite. The Council is relying on the GARM results since this was an assessment – not a reference point – exercise and it provids the best available science for decision makers.

Subsequent to preparation of the draft amendment and in response to comments received at public hearings, the NEFSC provided estimates of fishing mortality and stock size in 2003. These estimates were based on landings in calendar year 2003 are were projected forward from the GARM 2002. They were not developed through either a baseline or updated assessment and thus are subject to additional uncertainty. While these estimates were used in developing the rebuilding strategy, the impact of the proposed management action is still compared to the 2001 fishing mortality rates throughout the document. The 2002 estimates are provided below.

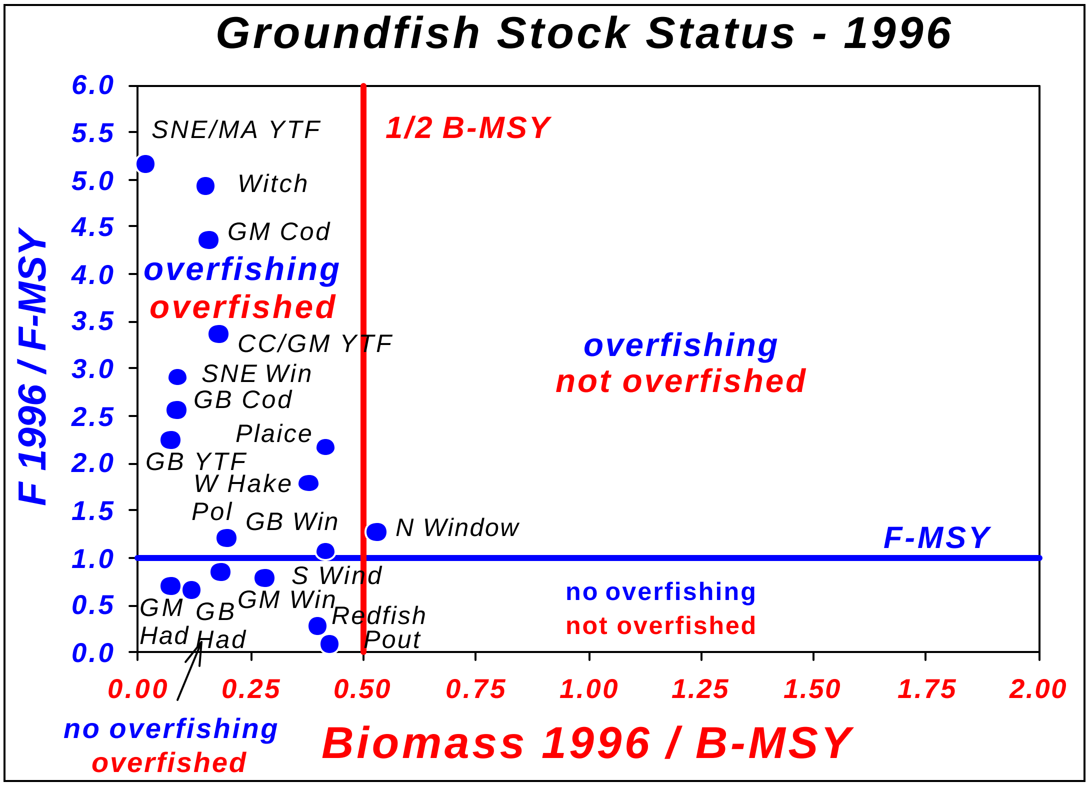


Figure 227 – Groundfish stock status, 1996 (NEFSC, unpublished data)

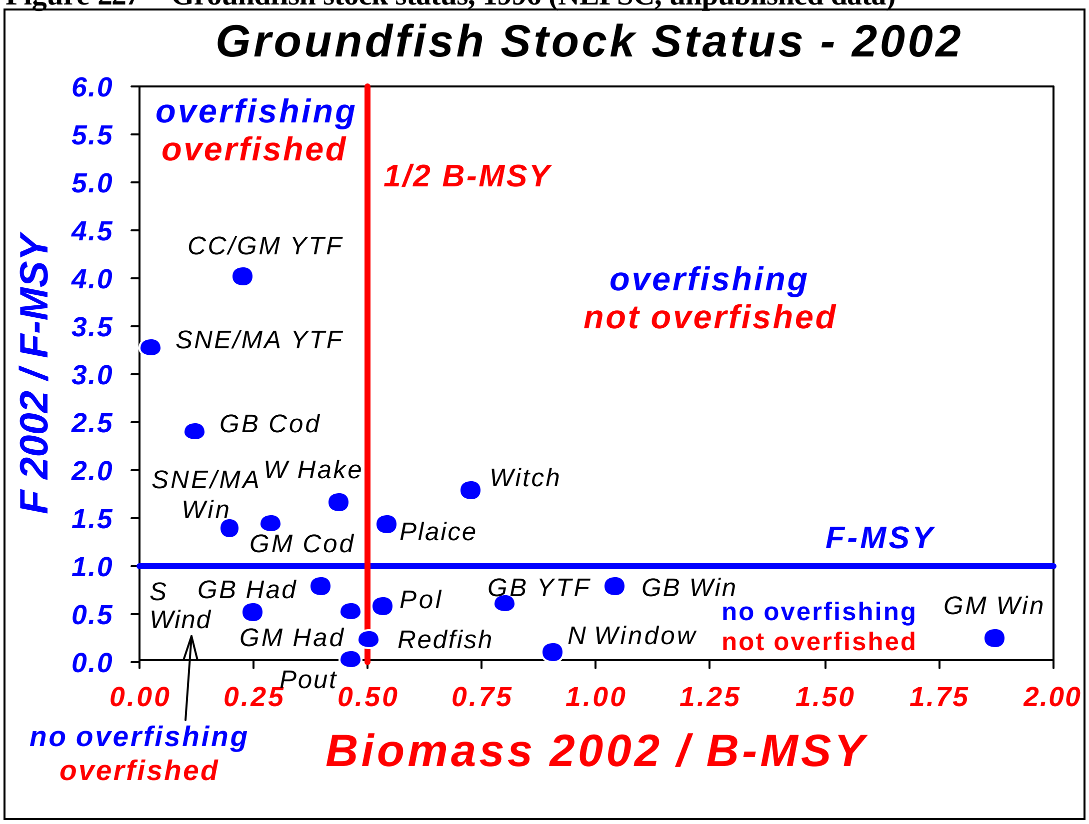


Figure 228 - Groundfish stock status, 2002 (NEFSC, unpublished data)

	Biomass		Fishing Mortality	
Stock	**2001**	**2002 (Projected)**	**2001**	**2002 (Projected)**
GOM Cod	22,000 mt	23,850	0.47	0.33
GB Cod	29,170 mt	26,560	0.38	0.43
GB Haddock	74,400 mt	99,570	0.22	0.20
GOM Haddock(1)	10.31	10.28	0.12	0.12
GB Yellowtail Flounder	39,000 mt	47,100	0.13	0.15
Cape Cod/GOM Yellowtail Flounder	3,200 mt	2,840	0.75	0.68
SNE/MA yellowtail flounder	1,900 mt	1,540	0.91	0.85
American Plaice	13,822 mt	15,570	0.43	0.27
Witch Flounder(3)	12,300 mt	18,300	0.76	0.41
GOM Winter Flounder	5.37	7,690	0.14	0.10
GB Winter Flounder(2)	9,805	9,805	0.25	0.25
SNE/MA Winter Flounder	7,600 mt	5,970	0.51	0.44
Acadian Redfish	119,600 mt (2000)	119,600	0.01	0.01
White Hake(1)	2.35	3.37	1.36	0.91
Pollock(1)	1.60	1.74	3.55	3.30
Windowpane Flounder (North)(1)	0.79	0.85	0.1	0.09
Windowpane Flounder (South)(1)	0.21	0.23	0.69	0.50
Ocean Pout(1)	2.46	2.28	0.007	0.01
Atlantic Halibut	0.2		Unknown	Unknown

Table 381 – Stock biomass and fishing mortality (2001). Units are SSB and fully-recruited fishing mortality unless noted. Sources: 2001 estimates based on GARM 2002, SAW 35, and SAW 37; 2002 estimates from NEFSC (unpublished data) and SAW 37.

(1) Biomass based on fall survey index, mortality based on relative exploitation rate (multi-year average)
(2) Total biomass and biomass weighted fishing mortality
(3) Witch flounder assessed in SAW 37. Estimates of 2001 fishing mortality were 57 percent higher than the 0.45 estimated by the GARM. This information was not provided to the Council until July, 2003.

9.2.1.2 Stock Status Uncertainty

The Council's understanding of current stock status is complicated by errors that may have been introduced due to problems in the conduct of the NEFSC trawl survey. NEFSC trawl surveys provide a fishery-independent measure of stock biomass. The NEFSC reported to the Council in September, 2002, that the trawl warps used on one of the survey vessels were inaccurately marked when installed in 2000. As the amendment was developed, there was a concern that this error may have affected the performance of the trawl net, as the marks are used to set equal amounts of cable on each leg of the trawl. For age-based assessments, the trawl survey is only on piece of data used to estimate stock size. It does, however, influence the terminal year estimates of stock size and fishing mortality. For index-based assessments, the trawl survey is the only data used to estimate stock size. Generally, a three year moving average is used.

The timing of the cable installation raised a concern that the survey index may need to be adjusted for two of the three most recent years, which will affect not only stock size estimates, but the relative exploitation rate that is calculated.

The GARM report (NEFSC 2002b) included sensitivity analyses for three different assumptions about the impact of the trawl warp problem on the survey index. For most stocks, assuming a change in the trawl survey index as a result of the warp problem did not result in a change in management advice. The exceptions were for plaice, GOM haddock, white hake, and SNE/MA yellowtail. The status of these stocks changes based on different assumptions of the impact of the warp error on survey indices.

A panel of experts reviewed the trawl warp issue – including experiments conducted to evaluate the impacts of the errors and the GARM sensitivity analyses – and concluded that the GARM analysis was sound (Payne et al. 2003). The Panel also recommended continuing to use the trawl survey data for New England groundfish, while recommending additional analyses of the performance of the surveys. The overall conclusion of the Panel was that the scientific information provided by the NEFSC (including stock status and estimates of status determination criteria) was accurate and should be used as the basis for management actions. For this reason, the amendment is based on the information provided by NEFSC 2002a and NEFSC 2002b and subsequent assessments.

9.2.2 Endangered Species and Marine Mammals

The Council has determined that the following species that are listed under the Endangered Species Act of 1973 (ESA) as endangered, threatened, or candidate species are found in the environment utilized by the fisheries regulated through proposed Amendment 13 to the Multispecies FMP. The Council has also included in the list below a number of species that are identified as protected under either the Marine Mammal Protection Act of 1972 (MMPA) or the Migratory Bird Act of 1918, as well as two right whale critical habitat designations that are found in the same area.

Cetaceans

Northern right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered
Minke whale (*Balaenoptera acutorostrata*)	Protected
Harbor porpoise (*Phocoena phocoena*)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
Pilot whale (*Globicephala* spp.)	Protected
White-sided dolphin (*Lagenorhynchus acutus*)	Protected
Common dolphin (*Delphinus delphis*)	Protected
Spotted and striped dolphins (*Stenella* spp.)	Protected
Bottlenose dolphin (*Tursiops truncatus*)	Protected

Seals

Harbor seal (*Phoca vitulina*)	Protected
Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Phoca groenlandica*)	Protected

Sea Turtles

Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered

Green sea turtle (*Chelonia mydas*)	Endangered
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered
Loggerhead sea turtle (*Caretta caretta*)	Threatened

Fish

Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)	Endangered
Barndoor skate (*Dipturus laevis*)	Candidate Species

Birds

Roseate tern (*Sterna dougallii dougallii*)	Endangered
Piping plover (*Charadrius melodus*)	Endangered

Critical Habitat Designations

Right whale	Cape Cod Bay Great South Channel

Although all of the protected species listed above may be found in the general geographical area covered by the Multispecies FMP, not all are affected by the fishery for several reasons. Some protected species may inhabit more inshore or offshore areas than those utilized by the groundfish species, prefer a different depth or temperature zone than multispecies or may migrate through the area at different times than the species regulated by the FMP. In addition, certain protected species may not be vulnerable to capture or entanglement in certain fishing gear used in the multispecies fishery. The above species list is divided into two groups. The first group contains those species not likely to be affected by Amendment 13 to the Multispecies FMP. The second group contains a more detailed assessment for the species that may be affected by Amendment 13 to the Multispecies FMP.

9.2.2.1 Protected Species Not Likely Affected by this FMP

The Council has reviewed the current information available on the distribution and habitat needs of the endangered, threatened, and otherwise protected species listed above in relation to the action being considered in the proposed Amendment 13 to the Multispecies FMP. Following this review, the Council has made an assessment that multispecies fishing operations, as managed by the proposed Amendment 13 to the Multispecies FMP, are not expected to affect the shortnose sturgeon *(Acipenser brevirostrum*), the Gulf of Maine distinct population segment (DPS) of Atlantic salmon (*Salmo salar*), the roseate tern (*Sterna dougallii dougallii*), the piping plover (*Charadrius melodus*) or the hawksbill sea turtle (*Eretmochelys imbricata*), all of which are listed species under the Endangered Species Act of 1973.

There are several cetaceans protected under the Marine Mammal Protection Act of 1972 (MMPA) that are found in the waters fished by the multispecies fishery, namely the Risso's dolphin (*Grampus griseus*), spotted and striped dolphins (*Stenella* spp.), and coastal forms of Atlantic bottlenose dolphin (*Tursiops truncatus*). Although these species may occasionally become entangled or otherwise entrapped in certain fishing gear such as pelagic longline and mid-water trawls, these gear types are not used in the multispecies fishery.

In addition, the Council believes that multispecies fishing operations will not adversely affect the right whale critical habitat areas listed above. The Council will be asking the NMFS and USFWS for concurrence in these assessments.

Shortnose Sturgeon

The shortnose sturgeon is benthic fish that mainly occupies the deep channel sections of several Atlantic coast rivers. They can be found in most major river systems from St. Johns River, Florida to the Saint John River in New Brunswick, Canada. The species is considered truly anadromous in the southern portion of its range (*i.e.*, south of Chesapeake Bay). However, they spend the majority of their life history within the fresh water sections of the northern rivers with only occasional forays into salt water, and are thus considered to be "freshwater amphidromous" (NMFS 1998a). There have been no documented cases of shortnose sturgeon taken in gear used in the multispecies fishery.

The multispecies fishery in the Northeast Region may extend to shallow water, but not into the intertidal zone of major river systems where shortnose sturgeon are likely to be found. Therefore, there appears to be adequate separation between the two species making it highly unlikely that the multispecies fisheries will affect shortnose sturgeon.

Atlantic Salmon

The wild populations of Atlantic salmon found in rivers and streams from the lower Kennebec River north to the U.S.-Canada border are considered to be endangered. These rivers include the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers and Cove Brook. Atlantic salmon are an anadromous species with spawning and juvenile rearing occurring in freshwater rivers followed by migration to the marine environment. Juvenile salmon in New England rivers typically migrate to sea in May after a two to three year period of development in freshwater streams, and remain at sea for two winters before returning to their U.S. natal rivers to spawn from mid October through early November. While at sea, salmon generally undergo an extensive northward migration to waters off Canada and Greenland. Data from past commercial harvest indicate that post-smolts overwinter in the southern Labrador Sea and in the Bay of Fundy. The numbers of wild Atlantic salmon that return to these rivers are perilously small, with total run sizes of approximately 150 spawners occurring in 1999 (Baum 2000).

Capture of Atlantic salmon have occurred in U.S. commercial fisheries or by research/survey vessels. However, none have been documented after 1992. No multispecies landings have been recorded for the areas adjacent to the Atlantic salmon rivers. In addition, the NMFS fishery research surveys have rarely found multispecies in the nearshore regions adjacent to the Atlantic salmon rivers. Therefore, it is unlikely that operation of the multispecies fisheries occurs in or near the rivers where concentrations of Atlantic salmon are most likely to be found. Furthermore, bottom-tending gear used in the multispecies fishery is not likely to encounter salmon in the open water environment, making it is highly unlikely that the fisheries occurring under the proposed Amendment 13 to the Multispecies FMP will affect the endangered runs of Atlantic salmon in the Gulf of Maine.

Roseate Tern and Piping Plover

The roseate tern and piping plover inhabit coastal waters and nest on coastal beaches within the Northeast Region. The terns prey on small schooling fishes, and the plovers prey on shoreline invertebrates and other small fauna. Foraging activity for these species occurs either along the shoreline (plovers) or within the top several meters of the water column (terns). Bottom-tending otter trawl, sink gillnet, and longline gear that are used in the multispecies fishery pose no threat to these species or their forage species.

Hawksbill Sea Turtle

The hawksbill turtle is relatively uncommon in the waters of the Northeast Region. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America where they feed primarily on a wide variety of sponges and mollusks. There are accounts of small hawksbills stranded as far north as Cape Cod, Massachusetts. However, many of these strandings were observed after hurricanes or offshore storms. No takes of hawksbill sea turtles have been recorded in northeast or Mid-Atlantic fisheries where observers have been deployed in the otter trawl (including the Mid-Atlantic) and sink gillnet fisheries that catch multispecies.

Hawksbills may occur in the southern range of the area (i.e., North Carolina and South Carolina), but their distribution is not known to overlap with those waters fished by vessels that may catch multispecies. Therefore, it is unlikely that interactions between hawksbill sea turtles and vessels that catch multispecies will occur.

Risso's Dolphin

The Risso's dolphin is distributed along the continental shelf edge of North America from Cape Hatteras to Georges Bank. The minimum population estimate for the Risso's dolphin that was derived from limited survey estimates that took place in U.S. waters is 22,916 (Waring et al. 2001). This species has been observed taken in the pelagic drift gillnet, pelagic longline, and mid-water trawl fisheries, but have never been reported in gear capable of catching multispecies. Although the Risso's dolphin feeding habitat overlaps with the distribution of the multispecies fishery, their pelagic prey species (squid and schooling fishes) would make it unlikely that they would encounter the bottom tending gear used in the multispecies fishery. Therefore, it is unlikely that the take in this fishery will occur at levels that compromise their ability to maintain optimum sustainable population levels, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Pelagic Delphinids (Spotted and Striped Dolphins)

The pelagic delphinid complex is made up of small odontocete species that are broadly distributed along the continental shelf edge where depths range from 200 - 400 meters. They are commonly found in large schools feeding on schools of fish. The minimum population estimates for each species number in the tens of thousands. They are known to be taken in pelagic and sink gillnets gear as well as mid-water trawl gear. Their pelagic prey species suggest they do not forage near the bottom, making it unlikely that they would encounter the bottom tending gear used in the multispecies fishery. Therefore, it is unlikely that the take in this fishery will be at levels that compromise their ability to maintain optimum sustainable population levels, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Coastal Bottlenose Dolphins

The coastal form of the bottlenose dolphin occurs in the shallow, relatively warm waters along the U.S. Atlantic coast from New Jersey to Florida and the Gulf of Mexico. They rarely range beyond the 25-meter depth contour north of Cape Hatteras. Although they are known to be taken in coastal sink gillnet operations, these fisheries do not overlap multispecies fishery areas. Waring et al. (2001) described the estimated total take of coastal bottlenose dolphins in all fisheries (including those that catch multispecies) to be below the PBR established for that stock. As described above, the proposed Amendment 13 to the Multispecies FMP will not increase the gillnet effort in the Northeast Region, and is not expected to extend into the more shallow range of the coastal bottlenose dolphin. Therefore, the proposed Amendment 13 to the Multispecies FMP will not further inhibit the ability of the bottlenose dolphin to achieve the optimum sustainable population level for the coastal stock, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Right Whale Critical Habitat

NMFS evaluated the potential effects of the federal multispecies fisheries on the two critical habitats that have been designated in the Great South Channel and Cape Cod Bay in the Opinion issued on June 14, 2001. NMFS evaluated the potential effects of the proposed fisheries operations on both prey availability and quality and nursery protection in the critical habitat. There was concern that the operation of these fisheries could diminish the value of the habitat by altering trophic dynamics that could reduce the availability of right whale prey within the critical habitat areas. However, right whales feed primarily on zooplankton that live in the mid-water zone, which are not likely adversely affected by bottom-tending multispecies gear directly. Therefore, the Council does not believe the multispecies fishery, as operated under the proposed Amendment 13 to the Multispecies FMP, will affect right whale critical habitat.

9.2.2.2 Status of Protected Species Potentially Affected by this FMP

The potential impacts to protected species that may result from the management alternatives and measures being considered under this Amendment are described in Section 4.2.6 of this document. The section below will focus on the status of the various species listed above that are found in the multispecies management area (Northeast Region) and may be affected by the fishing operations occurring under the proposed Amendment 13 to the Multispecies FMP. Additional background information on the range-wide status of these species and a description of right whale critical habitat can be found in a number of published documents, including sea turtle status reviews (NMFS and USFWS 1995, Marine Turtle Working Group - TEWG, 1998, 2000) and biological reports (USFWS 1997), recovery plans for the humpback whale (NMFS 1991a), right whale (NMFS 1991b), Kemp's Ridley sea turtle (USFWS and NMFS 1992), Atlantic green sea turtle (NMFS and USFWS 1991a), leatherback sea turtle (NMFS and USFWS 1992) and loggerhead sea turtle (NMFS and USFWS 1991b); and the 2001 Marine Mammal Stock Assessment Reports (Waring et al. 2001).

Right Whale

Right whales were found historically in all the world's oceans within the temperate to subarctic latitudes. There are three major subdivisions of right whales: North Pacific, North Atlantic, and Southern Hemisphere; with eastern and western subunits found in the North Atlantic (Perry et al. 1999). Because of our limited understanding of the genetic structure of the species, the conservative approach to conservation of this species has been to treat the subunits as separate groups whose survival and recovery is critical to the health of the species.

The northern right whale has the highest risk of extinction of all large whales. Scarcity of right whales is the result of an 800-year history of whaling that continued into the 1960s (Klumov 1962). Records indicate that right whales were subject to commercial whaling in the North Atlantic as early as 1059, with an estimated 25,000-40,000 right whales believed to have been taken between the 11^{th} and 17^{th} centuries. The size of the western North Atlantic right whale population at the termination of whaling is unknown. The stock was first recognized as seriously depleted as early as 1750. However, right whales continued to be taken in shore-based operations or opportunistically by whalers in search of other species as late as the 1920s. By the time the species was internationally protected in 1935 there may have been fewer than 100 North Atlantic right whales in the western North Atlantic (Hain 1975; Reeves et al. 1992; Kenney et al. 1995).

Intense whaling was also the cause of the critically endangered status of the North Pacific right whale. Currently, the North Pacific population is so small that no reliable estimate can be given. In the Atlantic, the eastern subpopulation of the North Atlantic population may already be extinct. The fact that the western North Atlantic subpopulation is the most numerous right whale population in the northern hemisphere, and is only estimated to number approximately 300 animals, is testimony to the severely depleted status of this species in the northern hemisphere. In contrast, the southern right whale is recovering with a growth rate of 7% in many areas.

Right whales appear to prefer shallow coastal waters, but their distribution is also strongly correlated to zooplankton prey distribution (Winn et al. 1986). In both northern and southern hemispheres, right whales are observed in the lower latitudes and more coastal waters during winter, where calving takes place, and then migrate to higher latitudes during the summer. In the western North Atlantic, they are found west of the Gulf Stream and are most commonly associated with cooler waters (<21º C). They are not found in the Caribbean and have been recorded only rarely in the Gulf of Mexico.

NMFS designated three right whale critical habitat areas on June 3, 1994 (59 FR 28793) to help protect important right whale foraging and calving areas within the U.S. These areas are: Cape Cod Bay; the Great South Channel (both off Massachusetts); and the waters adjacent to the southern Georgia and northern Florida coast. In 1993, Canada's Department of Fisheries declared two conservation areas for right whales;

one in the Grand Manan Basin in the lower Bay of Fundy, and a second in Roseway Basin between Browns and Baccaro Banks (Canadian Recovery Plan for the North Atlantic Right Whale 2000).

Right whales feed on zooplankton through the water column, and in shallow waters may feed near the bottom. In the Gulf of Maine, they have been observed feeding primarily on copepods, by skimming at or below the water's surface with open mouths (NMFS 1991b; Kenney et al. 1986; Murison and Gaskin 1989; and Mayo and Marx 1990). Research suggests that right whales must locate and exploit extremely dense patches of zooplankton to feed efficiently (Waring et al. 2001). New England waters include important foraging habitat for right whales and at least some portion of the right whale population is present in these waters throughout most months of the year. They are most abundant in Cape Cod Bay between February and April (Hamilton and Mayo 1990; Schevill et al. 1986; Watkins and Schevill 1982) and in the Great South Channel in May and June (Kenney et al. 1986; Payne et al. 1990) where they have been observed feeding predominantly on copepods, largely of the genera *Calanus* and *Pseudocalanus* (Waring et al. 2001). Right whales also frequent Stellwagen Bank and Jeffrey's Ledge, as well as Canadian waters including the Bay of Fundy and Browns and Baccaro Banks, in the spring and summer months. Mid-Atlantic waters are used as a migratory pathway from the spring and summer feeding/nursery areas to the winter calving grounds off the coast of Georgia and Florida.

However, much about right whale movements and habitat use are still unknown. Approximately 85% of the population is unaccounted for during the winter (Waring et al. 2001). Radio and satellite tagging has been used to track right whales, and has shown lengthy and somewhat distant excursions into deep water off the continental shelf (Mate et al. 1997). In addition photographs of identified individuals have documented movements of the western North Atlantic right whales as far north as Newfoundland, the Labrador Basin and southeast of Greenland (Knowlton et al. 1992). Sixteen satellite tags were attached to right whales in the Bay of Fundy, Canada, during summer 2000 in an effort to further elucidate the movements and important habitat for North Atlantic right whales. The movements of these whales varied, with some remaining in the tagging area and others making periodic excursions to other areas before returning to the Bay of Fundy. Several individuals were observed to move along the coastal waters of Maine, while others traveled to the Scotian Shelf off Nova Scotia. One individual was successfully tracked throughout the fall, and was followed on her migration to the Georgia/Florida wintering area.

Recognizing the precarious status of the right whale, the continued threats present in its coastal habitat throughout its range, and the uncertainty surrounding attempts to characterize population trends, the International Whaling Commission (IWC) held a special meeting of its Scientific Committee from March 19-25, 1998, in Cape Town, South Africa, to conduct a comprehensive assessment of right whales worldwide. The workshop's participants reviewed available information on the North Atlantic right whale. The conclusions of Caswell et al. (1999) were particularly alarming. Using data on reproduction and survival through 1996, Caswell determined that the western North Atlantic right whale population was declining at a rate of 2.4% per year, with one model suggesting that the mortality rate of the right whale population had increased five-fold in less than one generation. According to Caswell, if the mortality rate as of 1996 does not decrease and the population's reproductive performance does not improve, extinction could occur in 191 years and would be certain within 400 years.

The IWC Workshop participants expressed "considerable concern" in general for the status of the western North Atlantic right whales. This concern was based on recent (1993-1995) observations of near-failure of calf production, the significantly high mortality rate, and an observed increase in the calving interval. It was suggested that the slow but steady recovery rate published in Knowlton et al. (1994) may not be continuing. Workshop participants urgently recommended increased efforts to reduce the human-caused mortality factors affecting this right whale population.

As stated in the IWC Workshop, there has been concern over the decline in birth rate. In the three calving seasons following Caswell's analysis, only 10 calves are known to have been born into the population, with only one known right whale birth in the 1999/2000 season. However, the 2000/2001 calving season had 31 right whale calves sighted, with 27 surviving. Although these births are encouraging, biologists recognize that there may be some additional natural mortality with the 2000/2001 calves and cautious optimism is necessary because of how close the species is to extinction. In addition, efforts to reduce human-caused mortality must be accelerated if these individuals are to survive to sexual maturity and help reverse the population decline.

One question that has repeatedly arisen regarding the western North Atlantic population of right whales is the effect that "bottlenecking" may have played on the genetic integrity of right whales. Several genetics studies have attempted to examine the genetic diversity of right whales. Results from a study by Schaeff et al. (1997) indicate that North Atlantic right whales are less genetically diverse than southern right whales; a separate population that numbers at least four times as many animals with an annual growth rate of nearly seven percent. A recent study compared the genetic diversity of North Atlantic right whales with the genetic diversity of southern right whales. The researchers found only five distinct haplotypes (a maternal genetic marker) exist amongst 180 different North Atlantic right whales sampled, versus 10 haplotypes among just 16 southern right whales sampled. In addition, one of the five haplotypes found in the North Atlantic right whales was observed in only four animals; all males born prior to 1982 (Malik et al. 2000). Because this genetic marker can be passed only from female to offspring, there is an expectation that it will be lost from the population. Two interesting facts about this haplotype are: (1) the last known female with this type was an animal killed by the shore fishery at Amagansett, Long Island in 1907; and (2) this haplotype is basal to all others worldwide (i.e., it is the most ancient of all right whales).

Low genetic diversity is a general concern for wildlife populations. It has been suggested that North Atlantic right whales have been at a low population size for hundreds of years and, while the present population exhibits very low genetic diversity, the major effects of harmful genes are thought to have occurred well in the past, effectively eliminating those genes from the population (Kenney 2000). To determine how long North Atlantic right whales have exhibited such low genetic diversity, researchers have analyzed DNA extracted from museum specimens. Rosenbaum et al. (2000) found these samples represented four different haplotypes, all of which are still present in the current population, suggesting there has not been a significant loss of genetic diversity within the last 191 years. Although this sample size (n=6) was small, it supports the theory that significant reduction in genetic diversity likely occurred prior to the late 19^{th} century.

The role of contaminants or biotoxins in reducing right whale reproduction has also been raised. Contaminant studies have confirmed that right whales are exposed to and accumulate contaminants, but the effect that such contaminants might be having on right whale reproduction or survivability is unknown.

Competition for food resources is another possible factor impacting right whale reproduction. Researchers have found that North Atlantic right whales appear to have thinner blubber than right whales from the South Atlantic (Kenney, 2000). It has also been suggested that oceanic conditions affecting the concentration of copepods may in turn have an effect on right whales since they rely on dense concentrations of copepods to feed efficiently (Kenney 2000). However, evidence is lacking to demonstrate either that a decline in birth rate is related to depleted food resources or that there is a relationship between oceanic conditions and copepod abundance to right whale fitness and reproduction rates.

General Human Impacts and Entanglement

Right whales may be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries. However, the major known sources of anthropogenic mortality and injury of right whales clearly are ship strikes and entanglement in commercial fishing gear such as the sink gillnet gear used to catch multispecies.

Based on photographs of catalogued animals from 1959 and 1989, Kraus (1990) estimated that 57% of right whales exhibited scars from entanglement and 7% from ship strikes (propeller injuries). Hamilton et al. (1998) updated this work using data from 1935 through 1995. The new study estimated that 61.6% of right whales exhibit injuries caused by entanglement, and 6.4% exhibit signs of injury from vessel strikes. These data may be misleading, as a ship strike may be less of a "recoverable" event than entanglement in rope. It is also known that several whales have apparently been entangled on more than one occasion, and that some right whales that have been entangled were subsequently involved in ship strikes. Furthermore, these numbers are based on sightings of free-swimming animals that initially survive the entanglement or ship strike. Therefore, the actual number of interactions may be higher as some animals are likely drowned or killed immediately, and the carcass never recovered or observed.

The most recent data describing the observed entanglements of right whales is found in Table 126. It should be noted that no information is currently available on the response of the right whale population to recent (1997-1999) efforts to mitigate the effects of entanglement and ship strikes. However, as noted above, both entanglements and ship strikes have continued to occur. Therefore, it is not possible to determine whether the trend through 1996, as reported by Caswell, is continuing. Furthermore, results reported by Caswell suggest that it is not possible to determine that anthropogenic mortalities alone are responsible for the decline in right whale survival. However, the IWC concluded that reduction of anthropogenic mortalities would significantly improve the species' survival probability.

The best available information makes it reasonable to conclude that the current death rate exceeds the birth rate in the western North Atlantic right whale population. The nearly complete reproductive failure in this population from 1993 to 1995 and again in 1998 and 1999 suggests that this pattern has continued for almost a decade. Because no population can sustain a high death rate and low birth rate indefinitely, this combination places the North Atlantic right whale population at high risk of extinction. On a positive note, the 2000/2001 calving season was the most promising in the past 5 years. However, these young animals must be provided with protection so that they can mature and contribute to future generations in order to be a factor in stabilizing of the population.

Humpback Whale

Humpback whales calve and mate in the West Indies and migrate to feeding areas in the northwestern Atlantic during the summer months. Six separate feeding areas are utilized in northern waters (Waring et al. 2001). Only one of these feeding areas, the Gulf of Maine, lies within U.S. waters contained within the management unit of the FMP (Northeast Region). Most of the humpbacks that forage in the Gulf of Maine visit Stellwagen Bank and the waters of Massachusetts and Cape Cod Bays. Sightings are most frequent from mid-March through November between 41º N and 43º N, from the Great South Channel north along the outside of Cape Cod to Stellwagen Bank and Jeffreys Ledge (CeTAP 1982), and peak in May and August. However, small numbers of individuals may be present in this area year-round. They feed on a number of species of small schooling fishes, particularly sand lance and Atlantic herring, by filtering large amounts of water through their baleen to capture prey (Wynne and Schwartz 1999).

Data from a photographic identification catalogue of over 600 individual humpback whales have described the majority of the habitats used by this species (Barlow and Clapham 1997; Clapham et al. 1999). The photographic data have identified that reproductively mature western North Atlantic humpbacks winter in tropical breeding grounds in the Antilles, primarily on Silver and Navidad Banks north of the Dominican Republic. The primary winter range where calving and copulation is believed to take place also includes the Virgin Islands and Puerto Rico (NMFS 1991a). Calves are born from December through March and are about 4 meters at birth. Sexually mature females give birth approximately every 2 to 3 years. Sexual maturity is reached between 4 and 6 years of age for females and between 7 and 15 years for males. Size at maturity is about 12 meters.

Humpback whales use the mid-Atlantic as a migratory pathway. However, observations of juvenile humpbacks since 1989 in the mid-Atlantic have been increasing during the winter months, peaking January through March (Swingle et al. 1993). Biologists theorize that non-reproductive animals may be establishing a winter-feeding range in the mid-Atlantic since they are not participating in reproductive behavior in the Caribbean. The whales using this mid-Atlantic area were found to be residents of the Gulf of Maine and Atlantic Canada (Gulf of St. Lawrence and Newfoundland) feeding groups, suggesting a mixing of different feeding stocks in the mid-Atlantic region. Strandings and entanglements of humpback whales have increased between New Jersey and Florida during the same period (Wiley et al. 1995).

New information has become available on the status and trends of the humpback whale population in the North Atlantic that indicates the population is increasing. However, it has not yet been determined whether this increase is uniform across all six feeding stocks (Waring et al. 2001). For example, although the overall rate of increase has been estimated at 9.0% (CV=0.25) by Katona and Beard (1990), Barlow and Clapham (1997) reported a 6.5% rate through 1991 for the Gulf of Maine feeding group.

A variety of methods have been used to estimate the North Atlantic humpback whale population. However, the photographic mark-recapture analyses from the Years of the North Atlantic Humpback (YONAH) project gave a North Atlantic basin-wide estimate of 10,600 (95% c.i. = 9,300 - 12,100) is regarded as the best available estimate for that population.

General Human Impacts and Entanglement

The major known sources of anthropogenic mortality and injury of humpback whales include entanglement in commercial fishing gear such as the sink gillnet gear used to catch multispecies, and ship strikes. Based on photographs of the caudal peduncle of humpback whales, Robbins and Mattila (1999) estimated that between 48% and 78% of animals in the Gulf of Maine exhibit scarring caused by entanglement. Several whales have apparently been entangled on more than one occasion. These estimates are based on sightings of free-swimming animals that initially survive the encounter. The most recent data describing the observed entanglements of humpback whales is found in Table 126. Because some whales may drown immediately, the actual number of interactions may be higher. In addition, the actual number of species-gear interactions is contingent on the intensity of observations from aerial and ship surveys.

Humpback whales may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries.

Fin Whale

Fin whales inhabit a wide range of latitudes between 20-75° N and 20-75° S (Perry et al. 1999). Fin whales spend the summer feeding in the relatively high latitudes of both hemispheres, particularly along the cold eastern boundary currents in the North Atlantic and North Pacific Oceans and in Antarctic waters (IWC 1992). Most migrate seasonally from relatively high-latitude Arctic and Antarctic feeding areas in the summer to relatively low-latitude breeding and calving areas in the winter (Perry et al. 1999).

As was the case for the right and humpback whales, fin whale populations were heavily affected by commercial whaling. However, commercial exploitation of fin whales occurred much later than for right and humpback whales. Wide-scale commercial exploitation of fin whales did not occur until the 20th century when the use of steam power and harpoon-gun technology made exploitation of this faster, further offshore species feasible. In the southern hemisphere, over 700,000 fin whales were landed in the 20th century. More than 48,000 fin whales were taken in the North Atlantic between 1860 and 1970 (Perry et al. 1999). Fisheries existed off of Newfoundland, Nova Scotia, Norway, Iceland, the Faroe Islands, Svalbard (Spitsbergen), the British isles, Spain and Portugal. Fin whales were rarely taken in U.S. waters, except when they ventured near the shores of Provincetown, MA, during the late 1800s (Perry et al. 1999).

In the North Atlantic today, fin whales are widespread and occur from the Gulf of Mexico and Mediterranean Sea northward to the edges of the arctic pack ice (NMFS 1998b). A number of researchers have suggested the existence of fin whale subpopulations in the North Atlantic. Mizroch et al. (1984) suggested that local depletions resulting from commercial over harvesting supported the existence of North Atlantic fin whale subpopulations. Others have used genetic information to support the existence of multiple subpopulations of fin whales in the North Atlantic and Mediterranean (Bérubé et al. 1998). Although the IWC's Scientific Committee proposed seven stocks for North Atlantic fin whales, it is uncertain whether these stock boundaries define biologically isolated units (Waring et al. 2001). NMFS has designated one stock of fin whale for U.S. waters of the North Atlantic (Waring et al. 2001) where the species is commonly found from Cape Hatteras northward.

Various estimates have been provided to describe the current status of fin whales in western North Atlantic waters. Based on the history and trends of whaling catch, an estimate of 3,590 to 6,300 fin whales was obtained for the entire western North Atlantic (Perry et al. 1999). Hain et al. (1992) estimated that about 5,000 fin whales inhabit the Northeastern United States continental shelf waters. The latest SAR (Waring et al. 2001) gives a best estimate of abundance for fin whales of 2,814 (CV = 0.21). However, this is considered an underestimate, as too little is known about population structure, and the estimate is derived from surveys over a limited portion of the western North Atlantic. There is also not enough information to estimate population trends.

Despite our broad knowledge of fin whales, less is known about their life history as compared to right and humpback whales. Age at sexual maturity for both sexes ranges from 5-15 years. Physical maturity is reached at 20-30 years. Conception occurs during a 5 month winter period in either hemisphere. After a 12-month gestation, a single calf is born. The calf is weaned between 6 and 11 months after birth. The mean calving interval is 2.7 years, with a range of between 2 and 3 years (Agler et al. 1993). Like right and humpback whales, fin whales are believed to use western North Atlantic waters primarily for feeding and migrate to more southern waters for calving. However, the overall pattern of fin whale movement consists of a less obvious north-south pattern of migration than that of right and humpback whales.

Based on acoustic recordings from hydrophone arrays, Clark (1995) reported the fin whale as the most acoustically common whale species heard in the North Atlantic and described a general pattern of fin whale movements in the fall from the Labrador/Newfoundland region, south past Bermuda, and into the West Indies. However, evidence regarding where the majority of fin whales winter, calve, and mate is still scarce.

The overall distribution of fin whales may be based on prey availability. This species preys opportunistically on both zooplankton and fish (Watkins et al. 1984). The predominant prey of fin whales varies greatly in different geographical areas depending on what is locally available. In the western North Atlantic, fin whales feed on a variety of small schooling fish (i.e., herring, capelin, sand lance) as well as squid and planktonic crustaceans (Wynne and Schwartz 1999). As with humpback whales, fin whales feed by filtering large volumes of water for their prey through their baleen plates. Photo identification studies in western North Atlantic feeding areas, particularly in Massachusetts Bay, have shown a high rate of annual return by fin whales, both within years and between years (Seipt et al. 1990).

As discussed above, fin whales were the focus of commercial whaling, primarily in the 20th century. The IWC did not begin to manage commercial whaling of fin whales in the North Atlantic until 1976 and were not given total protection until 1987, with the exception of a subsistence whaling hunt for Greenland. In total, there have been 239 reported kills of fin whales from the North Atlantic from 1988 to 1995.

General Human Impacts and Entanglement

The major known sources of anthropogenic mortality and injury of fin whales include ship strikes and entanglement in commercial fishing gear such as the sink gillnet gear used to catch multispecies. However, many of the reports of mortality cannot be attributed to a particular source. Of 18 fin whale mortality records between 1991 and 1995, four were associated with vessel interactions, although the true cause of mortality was not known. Although several fin whales have been observed entangled in fishing gear, no mortalities have been attributed to gear entanglement.

In general, known mortalities of fin whales are less than those recorded for right and humpback whales. This may be due in part to the more offshore distribution of fin whales where they are either less likely to encounter entangling gear, or are less likely to be noticed when gear entanglements or vessel strikes do occur. Fin whales may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries.

Sei Whale

Sei whales are a widespread species in the world's temperate, subpolar and subtropical and even tropical marine waters. However, they appear to be more restricted to temperate waters than other balaenopterids (Perry et al. 1999). The IWC recognized three stocks in the North Atlantic based on past whaling operations: (1) Nova Scotia; (2) Iceland Denmark Strait; (3) Northeast Atlantic (Donovan 1991 *in* Perry et al. 1999). Mitchell and Chapman (1977) suggested that the sei whale population in the western North Atlantic consists of two stocks, a Nova Scotian Shelf stock and a Labrador Sea stock. The Nova Scotian Shelf stock includes the continental shelf waters of the Northeast Region, and extends northeastward to south of Newfoundland. The IWC boundaries for this stock are from the U.S. east coast to Cape Breton, Nova Scotia and east to 42°W longitude (Waring et al. 2001). This is the only sei whale stock within the management unit of this FMP.

Sei whales became the target of modern commercial whalers primarily in the late 19th and early 20th century after stocks of other whales, including right, humpback, fin and blues, had already been depleted. Sei whales were taken in large numbers by Norway and Scotland from the beginning of modern whaling (NMFS 1998b). Small numbers were also taken off of Spain, Portugal, and West Greenland from the 1920's to 1950's (Perry et al. 1999). In the western North Atlantic, a total of 825 sei whales were taken on the Scotian Shelf between 1966-1972, and an additional 16 were by a shore-based Newfoundland whaling station (Perry et al. 1999). The species continued to be exploited in Iceland until 1986 even though measures to stop whaling of sei whales in other areas had been put into place in the 1970s (Perry et al. 1999). There is no estimate for the abundance of sei whales prior to commercial whaling. Based on whaling records, approximately14,295 sei whales were taken in the entire North Atlantic from 1885 to 1984 (Perry et al. 1999).

Sei whales winter in warm temperate or subtropical waters and summer in more northern latitudes. In the North Atlantic, most births occur in November and December when the whales are on the wintering grounds. Conception is believed to occur in December and January. Gestation lasts for 12 months and the calf is weaned at 6-9 months when the whales are on the summer feeding grounds (NMFS 1998b). Sei whales reach sexual maturity at 5-15 years of age. The calving interval is believed to be 2-3 years (Perry et al. 1999).

Sei whales occur in deep water throughout their range, typically over the continental slope or in basins situated between banks (NMFS 1998b). In the northwest Atlantic, the whales travel along the eastern Canadian coast in autumn on their way to and from the Gulf of Maine and Georges Bank where they occur in winter and spring. Within the Northeast Region, the sei whale is most common on Georges Bank and into the Gulf of Maine/Bay of Fundy region during spring and summer. Individuals may range as far south as North Carolina. It is important to note that sei whales are known for inhabiting an area for weeks at a time then disappearing for years or even decades. This has been observed all over the world, including in the southwestern Gulf of Maine in 1986, but the basis for this phenomenon is not clear.

Although sei whales may prey upon small schooling fish and squid in the Northeast Region, available information suggests that calanoid copepods are the primary prey of this species. There are occasional influxes of sei whales further into Gulf of Maine waters, presumably in conjunction with years of high copepod abundance inshore. Sei whales are occasionally seen feeding in association with right whales in the southern Gulf of Maine and in the Bay of Fundy, although there is no evidence of interspecific competition for food resources. There is very little information on natural mortality factors for sei whales. Possible causes of natural mortality, particularly for young, old, or otherwise compromised individuals are shark attacks, killer whale attacks, and endoparasitic helminthes (Perry et al. 1999).

There are insufficient data to determine trends of the sei whale population. Because there are no abundance estimates within the last 10 years, a minimum population estimate cannot be determined for management purposes (Waring et al. 2001). Abundance surveys are problematic because this species is difficult to distinguish from the fin whale and too little is known of the sei whale's distribution, population structure and patterns of movement.

<u>General Human Impacts and Entanglement</u>

Few instances of injury or mortality of sei whales due to entanglement or vessel strikes have been recorded in U.S. waters. Entanglement is not known to impact this species in the U.S. Atlantic, possibly because sei whales typically inhabit waters further offshore than most commercial fishing operations, or perhaps entanglements do occur but are less likely to be observed. However, due to the overlap of this species' observed range with the multispecies fishery areas that use sink gillnet gear, the potential for entanglement does exist. A small number of ship strikes of this species have been recorded, the most recent documented incident occurring in 1994 when a carcass was brought in on the bow of a container ship in Charlestown, Massachusetts. No entanglements in fishing gear have been observed or noted in stranding data. Similar impacts noted above for other baleen whales may also occur. Due to the deep-water distribution of this species, interactions that do occur are less likely to be observed or reported than those involving right, humpback, and fin whales that often frequent areas within the continental shelf.

Blue Whale

Like the fin whale, blue whales occur worldwide and are believed to follow a similar migration pattern from northern summering grounds to more southern wintering areas (Perry et al. 1999). Three subspecies have been identified: *Balaenoptera musculus musculus, B.m. intermedia*, and *B.m. brevicauda* (NMFS 1998c). Only *B. musculus* occurs in the northern hemisphere. Blue whales range in the North Atlantic from the subtropics to Baffin Bay and the Greenland Sea. The IWC currently recognizes these whales as one stock (Perry et al. 1999).

Blue whales were intensively hunted in all of the world's oceans from the turn of the century to the mid-1960s when development of steam-powered vessels and deck-mounted harpoon guns in the late 19th century made it possible to exploit them on an industrial scale (NMFS 1998c). Blue whale populations declined worldwide as the new technology spread and began to receive widespread use (Perry et al. 1999). Subsequently, the whaling industry shifted effort away from declining blue whale stocks and targeted other large species, such as fin whales, and then resumed hunting for blue whales when the species appeared to be more abundant (Perry et al. 1999). The result was a cyclical rise and fall, leading to severe depletion of blue whale stocks worldwide (Perry et al. 1999). In all, at least 11,000 blue whales were taken in the North Atlantic from the late 19th century through the mid-20th century.

Blue whales were given complete protection in the North Atlantic in 1955 under the International Convention for the Regulation of Whaling. There are no good estimates of the pre-exploitation size of the western North Atlantic blue whale stock but it is widely believed that this stock was severely depleted by the time legal protection was introduced in 1955 (Perry et al. 1999). Mitchell (1974) suggested that the stock numbered in the very low hundreds during the late 1960's through early 1970's (Perry et al. 1999). Photo-identification studies of blue whales in the Gulf of St. Lawrence from 1979 to 1995 identified 320 individual whales (NMFS 1998c). The NMFS recognizes a minimum population estimate of 308 blue whales within the Northeast Region (Waring et al. 2001).

Blue whales are only occasional visitors to east coast U.S. waters. They are more commonly found in Canadian waters, particularly the Gulf of St. Lawrence where they are present for most of the year, and in other areas of the North Atlantic. It is assumed that blue whale distribution is governed largely by food requirements (NMFS 1998c). In the Gulf of St. Lawrence, blue whales appear to predominantly feed on a variety of copepod species (NMFS 1998c).

Compared to the other species of large whales, relatively little is known about this species. Sexual maturity is believed to occur in both sexes at 5-15 years of age. Gestation lasts 10-12 months and calves nurse for 6-7 months. The average calving interval is estimated to be 2-3 years. Birth and mating both take place in the winter season (NMFS 1998c), but the location of wintering areas is speculative (Perry et al. 1999). In 1992 the U.S. Navy and contractors conducted an extensive blue whale acoustic survey of the North Atlantic and found concentrations of blue whales on the Grand Banks and west of the British Isles. One whale was tracked for 43 days during which time it traveled 1,400 nautical miles around the general area of Bermuda (Perry et al. 1999).

There is limited information on the factors affecting natural mortality of blue whales in the North Atlantic. Ice entrapment is known to kill and seriously injure some blue whales during late winter and early spring, particularly along the southwest coast of Newfoundland. Habitat degradation has been suggested as possibly affecting blue whales such as in the St. Lawrence River and the Gulf of St. Lawrence where habitat has been degraded by acoustic and chemical pollution. However, there is no data to confirm that blue whales have been affected by such habitat changes (Perry et al. 1999).

<u>General Human Impacts and Entanglement</u>

Entanglements in fishing gear such as the sink gillnet gear used in the multispecies fishery and ship strikes are believed to be the major sources of anthropogenic mortality and injury of blue whales. However, confirmed deaths or serious injuries are few. In 1987, concurrent with an unusual influx of blue whales into the Gulf of Maine, one report was received from a whale watch boat that spotted a blue whale in the southern Gulf of Maine entangled in gear described as probable lobster pot gear. A second animal found in the Gulf of St. Lawrence apparently died from the effects of an entanglement. In March 1998, a juvenile male blue whale was carried into Rhode Island waters on the bow of a tanker. The cause of death was determined to be due to a ship strike that may have occurred outside the U.S. EEZ (Waring et al. 2001).

Sperm Whale

Sperm whales inhabit all ocean basins, from equatorial waters to the polar regions (Perry et al. 1999). In the western North Atlantic they range from Greenland to the Gulf of Mexico and the Caribbean. The sperm whales that occur in the western North Atlantic are believed to represent only a portion of the total stock (Blaylock et al. 1995). Total numbers of sperm whales off the USA or Canadian Atlantic coast are unknown, although eight estimates from selected regions of the habitat do exist for select time periods. The best estimate of abundance for the North Atlantic stock of sperm whales is 4,702 (CV=0.36) (Waring et al. 2001). The IWC recognizes one stock for the entire North Atlantic (Waring et al. 2001).

The IWC estimates that nearly a quarter-million sperm whales were killed worldwide in whaling activities between 1800 and 1900 (IWC 1971). With the advent of modern whaling the larger rorqual whales were targeted. However as their numbers decreased, whaling pressure again focused on smaller rorquals and sperm whales. From 1910 to 1982 there were nearly 700,000 sperm whales killed worldwide from whaling activities (Clarke 1954). Some sperm whales were also taken off the U.S. Mid-Atlantic coast (Reeves and Mitchell 1988; Perry et al. 1999), and in the northern Gulf of Mexico (Perry et al. 1999). Recorded North Atlantic sperm whale catch numbers for Canada and Norway from 1904 to 1972 total 1,995. All killing of sperm whales was banned by the IWC in 1988.

Sperm whales generally occur in waters greater than 180 meters in depth with a preference for continental margins, seamounts, and areas of upwelling, where food is abundant (Leatherwood and Reeves 1983). Sperm whales in both hemispheres migrate to higher latitudes in the summer for feeding and return to lower latitude waters in the winter where mating and calving occur. Mature males typically range to higher latitudes than mature females and immature animals but return to the lower latitudes in the winter to breed (Perry et al. 1999). Waring et al. (1993) suggest sperm whale distribution is closely correlated with the Gulf Stream edge with a migration to higher latitudes during summer months where they are concentrated east and northeast of Cape Hatteras. Distribution extends further northward to areas north of Georges Bank and the Northeast Channel region in summer and then south of New England in fall, back to the mid-Atlantic Bight (Waring et al. 2001).

Mature females in the northern hemisphere ovulate April through August. A single calf is born after a 15-month gestation. A mature female will produce a calf every 4-6 years. Females attain sexual maturity at a mean age of nine years, while males have a prolonged puberty and attain sexual maturity at about age 20 (Waring et al. 2001). Male sperm whales may not reach physical maturity until they are 45 years old (Waring et al. 2001). The sperm whales prey consists of larger mid-water squid and fish species (Perry et al. 1999). Sperm whales, especially mature males in higher latitude waters, have been observed to take significant quantities of large demersal and deep water sharks, multispecies, and bony fishes.

<u>General Human Impacts and Entanglement</u>

Few instances of injury or mortality of sperm whales due to human impacts have been recorded in U.S. waters. Because of their generally more offshore distribution and their benthic feeding habits, sperm whales are less subject to entanglement than are right or humpback whales. However, the multispecies fishery is conducted near the shelf edge and utilizes fixed sink gillnet gear that may pose a threat to sperm whales.

Documented takes primarily involve offshore fisheries such as the offshore lobster pot fishery and pelagic driftnet and pelagic longline fisheries. Ships also strike sperm whales. Due to the offshore distribution of this species, interactions (both ship strikes and entanglements) that do occur are less likely to be reported than those involving right, humpback, and fin whales that more often occur in nearshore areas. Other impacts noted above for baleen whales may also occur.

Due to their offshore distribution, sperm whales tend to strand less often than, for example, right whales and humpbacks. Preliminary data for 2000 indicate that of ten sperm whales reported to the stranding network (nine dead and one injured) there was one possible fishery interaction, one ship strike (wounded with bleeding gash on side) and eight animals for which no signs of entanglement or injury were sighted or reported.

Minke Whale

Minke whales have a cosmopolitan distribution in polar, temperate, and tropical waters. The Canadian east coast population is one of four populations recognized in the North Atlantic. Minke whales off the eastern coast of the U.S. are considered to be part of this population that extends from Davis Strait off Newfoundland to the Gulf of Mexico. The species is common and widely distributed along the U.S. continental shelf. They show a certain seasonal distribution with spring and summer peak numbers, falling off in the fall to very low winter numbers. Like all baleen whales, the minke whale generally occupies the continental shelf proper.

Minke whales are known to be taken in sink gillnet gear used to catch multispecies (see Table 126). Waring et al. (2001) has described the estimated total take of minke whales in all fisheries (including those that catch multispecies) to be below the PBR established for that species. All vessels that utilize sink gillnet gear will be operating under the Multispecies FMP due to the requirement that any gear capable of catching multispecies must obtain a Multispecies permit. Since a sink gillnet cannot be deployed in the Northeast waters without the possibility of catching a species covered under the Multispecies FMP, they will be included in the effort control measures that will be developed under Amendment 13 to the Multispecies FMP. Amendment 13 is not likely to increase sink gillnet effort in the Northeast Region, and will not further inhibit the ability of minke whales to achieve the optimum sustainable population level for the North Atlantic stock, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Harbor Porpoise

Harbor porpoise are found primarily in the Gulf of Maine in the summer months. However, they migrate seasonally through regions where the multispecies are caught. For example, they move through the southern New England area where the multispecies fishery occurs in the spring (March and April). Harbor porpoise also move through the Massachusetts Bay and Jeffrey's Ledge region in the spring (April and May) and the fall (October November). They are not known to frequent the Georges Bank region where multispecies are also found.

Harbor porpoise are taken in sink gillnet gear used to catch multispecies (see Table 125). The historic level of serious injury and mortality of this species in sink gillnets was known to be high relative to the estimated population level, and was addressed in the Harbor Porpoise Take Reduction Plan (HPTRP) that was developed under the mandates of the MMPA. The HPTRP used a series of time/area closures and required use of acoustical pingers that have reduced the take to acceptable levels. NMFS recently reported in the Federal Register (67FR51234 dated August 7, 2002) that the estimated incidental take of harbor porpoise in U.S. waters for 2001 was 80 animals. The minimum population estimate for 1999 was established at 74,695, and the potential biological removal (PBR) for the harbor porpoise is now set at 747. Although the current mortality estimate is below the latest PBR level, the stock is still considered a strategic stock requiring continued measures to reduce human-caused mortality from commercial fishing. This is due to the fact that there are insufficient data to determine population trends for this species.

The multispecies fisheries that utilize sink gillnet gear operate under the Multispecies FMP that contains effort controls developed in part for protection of this species. Amendment 13 measures will continue, and are likely to increase this effort reduction. The gillnet fishery is also subject to the requirements of the HPTRP implemented by NMFS in December 2, 1998. The combination of measures implemented by the Multispecies FMP and the HTRP have significantly reduced harbor porpoise takes to acceptable levels under the MMPA.

Atlantic White-Sided Dolphin

White-sided dolphins are found in the temperate and sub-polar waters of the North Atlantic, primarily on the continental shelf waters out to the 100-meter depth contour. The species is distributed from central western Greenland to North Carolina, with the Gulf of Maine stock commonly found from Hudson Canyon to Georges Bank and into the Gulf of Maine to the Bay of Fundy. A minimum population estimate for the white-sided dolphin 19,196 has been derived for U.S. waters (Waring et al. 2001) from limited survey estimates. White-sided dolphins have been observed taken in the multispecies sink gillnet, the pelagic drift gillnet, and several mid-water and bottom trawl fisheries. Waring et al. (2001) described the estimated total take of white-sided dolphins in all fisheries (including those that catch multispecies) to be below the PBR established for that species. As described above for the minke whale, the proposed Amendment 13 to the Multispecies FMP will not increase the gillnet effort in the Northeast Region. Therefore, the proposed Amendment 13 to the Multispecies FMP will not further inhibit the ability of white-sided dolphins to achieve the optimum sustainable population level for the North Atlantic stock, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Pelagic Delphinids (Pilot whales, offshore bottlenose and common dolphins)

The pelagic delphinid complex is made up of small odontocete species that are broadly distributed along the continental shelf edge where depths range from 200 - 400 meters. They are commonly found in large schools feeding on schools of fish. The minimum population estimates for each species number in the tens of thousands. They are known to be taken in pelagic and sink gillnets gear as well as mid-water and bottom trawl gear. Although some takes have been observed in the bottom trawl fishery, their pelagic prey species suggest they do not forage near the bottom, making it unlikely that they would frequently encounter the bottom tending gear used in the multispecies fishery. Therefore, it is unlikely that the take in this fishery will be at levels that compromise their ability to maintain optimum sustainable population levels, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Harbor seal

The harbor seal is found in all nearshore waters of the Atlantic Ocean above about 30 degrees latitude (Waring et al. 2001). In the western North Atlantic they are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally the Carolinas (Boulva and McLaren 1979; Gilbert and Guldager 1998). It is believed that the harbor seals found along the U.S. and Canadian east coasts represent one population (Waring et al. 2001). Harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine, and occur seasonally along the southern New England and New York coasts from September through late-May. However, breeding and pupping normally occur only in waters north of the New Hampshire/Maine border. Since passage of the MMPA in 1972, the number of seals found along the New England coast has increased nearly five-fold with the number of pups seen along the Maine coast increasing at an annual rate of 12.9 percent during the 1981-1997 period (Gilbert and Guldager 1998). The minimum population estimate for harbor seals is 30,990 based on uncorrected total counts along the Maine coast in 1997 (Waring et al. 2001).

Harbor seals are taken in sink gillnet gear used to catch multispecies. Waring et al. (2001) has described the estimated total take of harbor seals in all fisheries to be below the PBR of 1,859 established for that species. All vessels that utilize sink gillnet gear will be operating under the Multispecies FMP due to the requirement that any gear capable of catching multispecies must obtain a multispecies permit. Since a sink gillnet cannot be deployed in the Northeast waters without the possibility of catching a species managed under the Multispecies FMP, they will be included in the effort control measures that will be developed under Amendment 13 to the Multispecies FMP. Amendment 13 is not likely to increase sink gillnet effort in the Northeast Region. Therefore, it will not further inhibit the ability of harbor seals to achieve the optimum sustainable population level for the North Atlantic stock, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Gray seal

The gray seal is found on both sides of the North Atlantic, with the western North Atlantic population occurring from New England to Labrador. There are two breeding concentrations in eastern Canada - one at Sable Island and one that breeds on the pack ice in the Gulf of St Lawrence. There are several small breeding colonies on isolated islands along the coast of Maine and on outer Cape Cod and Nantucket Island in Massachusetts (Waring et al. 2001). The population estimates for the Sable Island and Gulf of St. Lawrence breeding groups was 143,000 in 1993. The gray seal population in Massachusetts has increased from 2,010 in 1994 to 5,611 in 1999, although it is not clear how much of this increase may be due to animals emigrating from northern areas. Approximately 150 gray seals have been observed on isolated island off Maine.

Gray seals are taken in sink gillnet gear used to catch multispecies. Waring et al. (2001) has described the estimated total take of gray seals from 1959 to 1999 in all fisheries to be between 50 and 155 animals which is well below the PBR of 8,850 established for that species. As stated in the harbor seal discussion above, all vessels that utilize sink gillnet gear will be operating under the Multispecies FMP and thus included in the effort control measures that will be developed under Amendment 13. Amendment 13 is not likely to increase sink gillnet effort in the Northeast Region. Therefore, it will not further inhibit the ability of gray seals to achieve the optimum sustainable population level for the North Atlantic stock, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Harp seal

The harp seal occurs throughout much of the North Atlantic and Arctic Oceans, and have been increasing off the East Coast of the United States from Maine to New Jersey. Harp seals are usually found off the U.S. from January to May when the western stock of harp seals is at their most southern point of migration (Waring et al. 2001). Harp seals congregate on the edge of the pack ice in February through April when breeding and pupping takes place. The harp seal is highly migratory, moving north and south with the edge of the pack ice. Non-breeding juveniles will migrate the farthest south in the winter, but the entire population moves north toward the Arctic in the summer. The minimum population estimate for the western North Atlantic is 5.2 million seals.

A large number of harp seals are killed in Canada, Greenland and the Arctic. The allowed kill was set at 275,000 in 1997 by the Canada DFO. Mortality in Greenland and the Arctic may exceed 100,000 (Waring et al. 2001). Harp seals are also taken in sink gillnet gear used to catch multispecies. Waring et al. (2001) has described the estimated total take of harp seals from 1959 to 1999 in all fisheries to range between 78 and 694 animals depending on the location of the pack ice edge which drives the seals farther south into the range of the sink gillnet fishery. Even with the highest takes observed, the take is well below the PBR of 156,000 established for that species. As stated in the harbor seal discussion above, all vessels that utilize sink gillnet gear will be operating under the Multispecies FMP and thus included in the effort control measures that will be developed under Amendment 13. Amendment 13 is not likely to increase sink gillnet effort in the Northeast Region. Therefore, it will not further inhibit the ability of harp seals to achieve the optimum sustainable population level for the North Atlantic stock, or cause their serious injury and mortality levels to exceed the PBR levels allowed for commercial fisheries under the MMPA.

Leatherback Sea Turtle

Leatherback turtles are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico (Ernst and Barbour 1972). The leatherback sea turtle is the largest living turtle and ranges farther than any other sea turtle species, exhibiting broad thermal tolerances that allow it to forage into the colder Northeast Region waters (NMFS and USFWS, 1995). Evidence from tag returns and strandings in the western North Atlantic suggests that adults engage in routine migrations between boreal, temperate and tropical waters (NMFS and USFWS, 1992). In the U.S., leatherback turtles are found throughout the western North Atlantic during the warmer months along the continental shelf, and near the Gulf Stream edge. A 1979 aerial survey of the outer Continental Shelf from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia showed leatherbacks to be present throughout the area with the most numerous sightings made from the Gulf of Maine south to Long Island (CeTAP 1982). Shoop and Kenney (1992) also observed concentrations of leatherbacks during the summer off the south shore of Long Island and New Jersey. Leatherbacks in these waters are thought to be following jellyfish, their preferred prey.

Compared to the current knowledge regarding loggerhead populations, the genetic distinctness of leatherback populations is less clear. However, genetic analyses of leatherbacks to date indicate female turtles nesting in St. Croix/Puerto Rico and those nesting in Trinidad differ from each other and from turtles nesting in Florida, French Guiana/Suriname and along the South African Indian Ocean coast. Since populations or subpopulations of leatherback sea turtles have not been formally recognized, the conservative approach is to treat leatherback nesting populations as distinct.

Leatherbacks are predominantly pelagic species and feed on jellyfish and other soft-bodied prey. Time-depth-recorder data collected by Eckert et al. (1996) indicate that leatherbacks are night feeders and are deep divers, with recorded dives to depths in excess of 1,000 meters. However, leatherbacks may feed in shallow waters if there is an abundance of jellyfish near shore. For example, leatherbacks occur annually in shallow bays such as Cape Cod and Narragansett Bays during the fall.

Leatherbacks are a long lived species (> 30 years), with an estimated age at sexual maturity reported as about 13-14 years for females, and an estimated minimum age at sexual maturity of 5-6 years, with (Zug and Parham 1996 and NMFS 2001). Leatherbacks nest from March through July and produce 100 eggs or more in each clutch, or a total of 700 eggs or more per nesting season (Schultz 1975). The eggs will incubate for 55-75 days before hatching. The habitat requirements for post-hatchling leatherbacks that reach the ocean are virtually unknown (NMFS and USFWS 1992).

Status and Trends of Leatherback Sea Turtles

Estimated to number approximately 115,000 adult females globally in 1980 (Pritchard 1982) and only 34,500 by 1995 (Spotila et al. 1996), leatherback populations have been decimated worldwide, not only by fishery related mortality but, at least historically, primarily due to exploitation of eggs (Ross 1979). On some beaches nearly 100% of the eggs laid have been harvested (Eckert 1996).

Nest counts are currently the only reliable indicator of population status available for leatherback turtles. The status of the leatherback population in the Atlantic is difficult to assess since major nesting beaches occur over broad areas within tropical waters outside the United States. Recent information suggests that western North Atlantic populations declined from 18,800 nesting females in 1996 (Spotila et al. 1996) to 15,000 nesting females by 2000. In contrast, Eastern Atlantic (i.e., off Africa, numbering ~ 4,700) and Caribbean (4,000) populations appear to be stable. It does appear that the Western Atlantic portion of the population is being subjected to mortality beyond sustainable levels, resulting in a continued decline in numbers of nesting females.

General Human Impacts and Entanglement

Anthropogenic impacts to the leatherback population include fishery interactions as well as exploitation of the eggs (Ross 1979). Eckert (1996) and Spotila et al. (1996) record that adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries. Zug and Parham (1996) attribute the sharp decline in leatherback populations to the combination of the loss of long-lived adults in fishery related mortality, and the lack of recruitment stemming from elimination of annual influxes of hatchlings because of egg harvesting.

Poaching is not known to be a problem for U.S. nesting populations. However, numerous fisheries that occur in both U.S. state and federal waters are known to negatively impact juvenile and adult leatherback sea turtles. These include incidental take in several commercial and recreational fisheries. Fisheries known or suspected to incidentally capture leatherbacks include those deploying bottom trawls, off-bottom trawls, purse seines, bottom longlines, hook and line, gill nets, drift nets, traps, haul seines, pound nets, beach seines, and surface longlines (NMFS and USFWS 1992).

Leatherback interactions with the southeast shrimp fishery are well documented. Turtle Excluder Devices (TEDs), typically used in the southeast shrimp fishery to minimize sea turtle/fishery interactions, are less effective for the larger leatherbacks. Therefore, the NMFS established a zone to restrict, when necessary, shrimp trawl activities from off the coast of Cape Canaveral, Florida to the Virginia/North Carolina Border.

Leatherbacks are also susceptible to entanglement in lobster and crab pot gear. The probable reasons include: attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface; attraction to the buoys which could appear as prey; or the gear configuration which may be more likely to wrap around flippers. The total number of leatherbacks reported entangled from New York through Maine from all sources for the years 1980 - 2000 is 119. Entanglements are also common in Canadian waters where Goff and Lien (1988) reported that 14 of 20 leatherbacks encountered off the coast of Newfoundland/Labrador were entangled in fishing gear including salmon nets, herring nets, gillnets, trawl lines and crab pot lines. Prescott (1988) reviewed stranding data for Cape Cod Bay and concluded that for those turtles where cause of death could be determined (the minority), entanglement in fishing gear is the leading cause of death followed by capture by dragger, cold stunning, or collision with boats.

As noted, there are many human-related sources of mortality to leatherbacks. A tally of all leatherback takes anticipated annually under current biological opinions was projected to be as many as 801 leatherback takes, although this sum includes many takes expected to be nonlethal.

Leatherbacks have a number of pressures on their populations, including injury or mortality in fisheries, other federal activities (e.g., military activities, oil and gas development, etc.), degradation of nesting habitats, direct harvest of eggs, juvenile and adult turtles, the effects of ocean pollutants and debris, lethal collisions, and natural disturbances such as hurricanes that are capable of destroying nesting beaches. Spotila et al. (1996) conclude, “stable leatherback populations could not withstand an increase in adult mortality above natural background levels without decreasing the Atlantic population is the most robust, but it is being exploited at a rate that cannot be sustained and if this rate of mortality continues, these populations will also decline.”

Kemp’s Ridley Sea Turtle

The Kemp’s ridley is the most endangered of the world’s sea turtle species. Of the world’s seven extant species of sea turtles, the Kemp's ridley has declined to the lowest population level. Kemp’s ridleys nest in daytime aggregations known as arribadas, primarily on a stretch of beach in Mexico called Rancho Nuevo. Most of the population of adult females nest in this single locality (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the early 1970s, the world population estimate of mature female Kemp's ridleys had been reduced to 2,500-5,000 individuals. The population declined further through the mid-1980s.

Status and Trends of Kemp’s Ridley Sea Turtles

The TEWG (1998; 2000) indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Nesting data, estimated number of adults, and percentage of first time nesters have all increased from lows experienced in the 1970s and 1980s. From 1985 to 1999, the number of nests observed at Rancho Nuevo and nearby beaches has increased at a mean rate of 11.3% per year, allowing cautious optimism that the population is on its way to recovery. For example, nesting data indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and 702 nests in 1985 then increased to produce 1,940 nests in 1995. Estimates of adult abundance followed a similar trend from an estimate of 9,600 in 1966 to 1,050 in 1985 and 3,000 in 1995. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6% to 28% from 1981 to 1989 and from 23% to 41% from 1990 to 1994.

Kemp’s ridley nesting occurs from April through July each year. Little is known about mating but it is believed to occur before the nesting season in the vicinity of the nesting beach. Hatchlings emerge after 45-58 days. Once they leave the beach, neonates presumably enter the Gulf of Mexico where they feed on available sargassum and associated infauna or other epipelagic species (USFWS and NMFS, 1992). Ogren (1988) suggests that the Gulf coast, from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern Gulf of Mexico. However, at least some juveniles will travel northward as water temperatures warm to feed in productive coastal waters off Georgia through New England (USFWS and NMFS, 1992).

Juvenile Kemp’s ridleys use northeastern and Mid-Atlantic coastal waters of the U.S. Atlantic coastline as primary developmental habitat during summer months, with shallow coastal embayments serving as important foraging grounds. Ridleys found in Mid- Atlantic waters are primarily post-pelagic juveniles averaging 40 centimeters in carapace length, and weighing less than 20 kilograms (Terwilliger and Musick

1995). Next to loggerheads, they are the second most abundant sea turtle in Virginia and Maryland waters, arriving in these areas during May and June (Keinath et al., 1987; Musick and Limpus, 1997). Studies have found that post-pelagic ridleys feed primarily on a variety of species of crabs. Mollusks, shrimp, and fish are consumed less frequently (Bjorndal, 1997).

With the onset of winter and the decline of water temperatures, ridleys migrate to more southerly waters from September to November (Keinath et al., 1987; Musick and Limpus, 1997). Turtles who do not head south soon enough face the risks of cold stunning in northern waters. Cold stunning can be a significant natural cause of mortality for sea turtles in Cape Cod Bay and Long Island Sound. For example, in the winter of 1999/2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green turtles were found on Cape Cod beaches. The severity of cold stun events depends on: the numbers of turtles utilizing Northeast waters in a given year; oceanographic conditions; and the occurrence of storm events in the late fall. Cold-stunned turtles have also been found on beaches in New York and New Jersey. Cold-stunning events can represent a significant cause of natural mortality, in spite of the fact that many cold-stunned turtles can survive if found early enough.

<u>General Human Impacts and Entanglement</u>

Like other turtle species, the severe decline in the Kemp's ridley population appears to have been heavily influenced by a combination of exploitation of eggs and impacts from fishery interactions. From the 1940s through the early 1960s, nests from Ranch Nuevo were heavily exploited (USFWS and NMFS, 1992), but beach protection in 1966 helped to curtail this activity (USFWS and NMFS, 1992). Currently, anthropogenic impacts to the Kemp's ridley population are similar to those discussed above for other sea turtle species. Takes of Kemp's ridley turtles have been recorded by sea sampling coverage in the Northeast otter trawl fishery, pelagic longline fishery, and southeast shrimp and summer flounder bottom trawl fisheries.

Kemp's ridleys may also be affected by large-mesh gillnet fisheries. In the spring of 2000, a total of five Kemp's ridley carcasses were recovered from a North Carolina beach where 277 loggerhead carcasses were found. Cause of death for most of the turtles recovered was unknown, but the mass mortality event was suspected to have been from a large-mesh gillnet fishery operating offshore in the preceding weeks. It is possible that strandings of Kemp's ridley turtles in some years have increased at rates higher than the rate of increase in the Kemp's ridley population (TEWG 1998).

Green Sea Turtle

Green turtles are distributed circumglobally. In the western Atlantic they range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean, but are considered rare north of Cape Hatteras (Wynne and Schwartz, 1999). Most green turtle nesting in the continental United States occurs on the Atlantic Coast of Florida (Ehrhart 1979). Green turtles were traditionally highly prized for their flesh, fat, eggs, and shell, and directed fisheries in the United States and throughout the Caribbean are largely to blame for the decline of the species. In the Gulf of Mexico, green turtles were once abundant enough in the shallow bays and lagoons to support a commercial fishery. However, declines in the turtle fishery throughout the Gulf of Mexico were evident by 1902 (Doughty 1984).

In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida panhandle (Meylan et al. 1995). The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring, perhaps due to increased protective legislation throughout the Caribbean (Meylan et al., 1995). Increased nesting has also been observed along the Atlantic Coast of Florida, on beaches where only loggerhead nesting was observed in the past). Recent population estimates for the western Atlantic area are not available.

While nesting activity is obviously important in determining population distributions, the remaining portion of the green turtle's life is spent on the foraging and breeding grounds. Juvenile green sea turtles occupy pelagic habitats after leaving the nesting beach. Pelagic juveniles are assumed to be omnivorous, but with a strong tendency toward carnivory during early life stages. At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas, shifting to a chiefly herbivorous diet (Bjorndal 1997). Green turtles appear to prefer marine grasses and algae in shallow bays, lagoons and reefs (Rebel 1974) but also consume jellyfish, salps, and sponges.

As is the case for loggerhead and Kemp's ridley sea turtles, green sea turtles use mid-Atlantic and northern areas of the western Atlantic coast as important summer developmental habitat. Green turtles are found in estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and North Carolina sounds (Musick and Limpus 1997). Like loggerheads and Kemp's ridleys, green sea turtles that use northern waters during the summer must return to warmer waters when water temperatures drop, or face the risk of cold stunning. Cold stunning of green turtles may occur in southern areas as well (*i.e.*, Indian River, Florida), as these natural mortality events are dependent on water temperatures and not solely geographical location.

<u>General Human Impacts and Entanglement</u>

Anthropogenic impacts to the green sea turtle population are similar to those discussed above for other sea turtles species. As with the other species, fishery mortality accounts for a large proportion of annual human-caused mortality outside the nesting beaches, while other activities like dredging, pollution, and habitat destruction account for an unknown level of other mortality. Sea sampling coverage in the pelagic driftnet, pelagic longline, scallop dredge, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles.

Loggerhead Sea Turtle

Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans in a wide range of habitats. These include open ocean, continental shelves, bays, lagoons, and estuaries (NMFS and USFWS 1995). Loggerhead sea turtles are primarily benthic feeders, opportunistically foraging on crustaceans and mollusks (Wynne and Schwartz 1999). Under certain conditions they may also scavenge fish (NMFS and USFWS 1991b). Horseshoe crabs are known to be a favorite prey item in the Chesapeake Bay area (Lutcavage and Musick 1985).

<u>Status and Trends of Loggerhead Sea Turtles</u>

The loggerhead sea turtle was listed as threatened under the ESA on July 28, 1978. The species was considered to be a single population in the North Atlantic at the time of listing. However, further genetic analyses conducted at nesting sites indicate the existence of five distinct subpopulations ranging from North Carolina, south along the Florida east coast and around the keys into the Gulf of Mexico, to nesting sites in the Yucatan peninsula and Dry Tortugas (TEWG 2000 and NMFS SEFSC 2001). Natal homing to those nesting beaches is believed to provide the genetic barrier between these nesting aggregations, preventing recolonization of turtles from other nesting beaches.

The threatened loggerhead sea turtle is the most abundant of the sea turtles listed as threatened or endangered in the U.S. waters. In the western North Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the gulf coast of Florida. The southeastern U.S. nesting aggregation is the second largest and represents about 35 % of the nests of this species. The total number of nests along the U.S. Atlantic and Gulf coasts between 1989 and 1998, ranged from 53,014 to 92,182 annually, with a mean of 73,751. Since a female often lays multiple nests in any one season, the average adult female population was estimated to be 44,780 (Murphy and Hopkins 1984).

However, the status of the northern loggerhead subpopulation is of particular concern. Based on the above, there are only an estimated 3,800 nesting females in the northern loggerhead subpopulation, and the status of this northern population based on number of loggerhead nests, has been classified declining or stable

(TEWG 2000). Another factor that may add to the vulnerability of the northern subpopulation is that genetics data show that the northern subpopulation produces predominantly males (65%). In contrast, the much larger south Florida subpopulation produces predominantly females (80%) (NMFS SEFSC 2001).

The activity of the loggerhead is limited by temperature. Loggerheads commonly occur throughout the inner continental shelf from Florida through Cape Cod, Massachusetts. Loggerheads may also occur as far north as Nova Scotia when oceanographic and prey conditions are favorable. Surveys conducted offshore as well as sea turtle stranding data collected during November and December off North Carolina suggest that sea turtles emigrating from northern waters in fall and winter months may concentrate in nearshore and southerly areas influenced by warmer Gulf Stream waters (Epperly et al. 1995). This is supported by the collected work of Morreale and Standora (1998) who tracked 12 loggerheads and 3 Kemp's ridleys by satellite. All of the turtles followed similar spatial and temporal corridors, migrating south from Long Island Sound, New York, during October through December. The turtles traveled within a narrow band along the continental shelf and became sedentary for one or two months south of Cape Hatteras.

Loggerhead sea turtles do not usually appear on the most northern summer foraging grounds in the Gulf of Maine until June, but are found in Virginia as early as April. They remain in the mid-Atlantic and northeast areas until as late as November and December in some cases, but the majority leaves the Gulf of Maine by mid-September. Aerial surveys of loggerhead turtles north of Cape Hatteras indicate that they are most common in waters from 22 to 49 meters deep, although they range from the beach to waters beyond the continental shelf (Shoop and Kenney 1992).

All five loggerhead subpopulations are subject to natural phenomena that cause annual fluctuations in the number of young produced. For example, there is a significant overlap between hurricane seasons in the Caribbean Sea and northwest Atlantic Ocean (June to November), and the loggerhead sea turtle nesting season (March to November). Sand accretion and rainfall that result from these storms as well as wave action can appreciably reduce hatchling success. In 1992, Hurricane Andrew affected turtle nests over a 90-mile length of coastal Florida; all of the eggs were destroyed by storm surges on beaches that were closest to the eye of this hurricane (Milton et al. 1994). Other sources of natural mortality include cold stunning and biotoxin exposure.

General Human Impacts and Entanglement

The diversity of the sea turtles life history leaves them susceptible to many human impacts, including impacts on land, in the benthic environment, and in the pelagic environment. Anthropogenic factors that impact the success of nesting and hatching include: beach erosion, beach armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, and an increased presence of native species (e.g., raccoons, armadillos, and oppossums) which raid and feed on turtle eggs.

Loggerhead sea turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic gyre for as long as 7-12 years before settling into benthic environments. Loggerhead sea turtles are impacted by a completely different set of threats from human activity once they migrate to the ocean. During that period, they are exposed to a series of long-line fisheries that include the U.S. Atlantic tuna and swordfish longline fisheries, an Azorean long-line fleet, a Spanish long-line fleet, and various fleets in the Mediterranean Sea (Aguilar et al. 1995, Bolten et al. 1994, Crouse 1999). Observer records indicate that, of the 6,544 loggerheads estimated to be captured by the U.S. Atlantic tuna and swordfish longline fleet between 1992-1998, an estimated 43 were dead (Yeung 1999). For 1998, alone, an estimated 510 loggerheads (225-1250) were captured in the longline fishery. Aguilar et al. (1995) estimated that the Spanish swordfish longline fleet, which is only one of the many fleets operating in the region, captures more than 20,000 juvenile loggerheads annually (killing as many as 10,700).

Once loggerheads enter the benthic environment in waters off the coastal U.S., they are exposed to a suite of fisheries in federal and State waters including trawl, purse seine, hook and line, gillnet, pound net, longline, and trap fisheries. Loggerhead sea turtles are captured in fixed pound net gear in the Long Island Sound, in pound net gear and trawls in summer flounder and other finfish fisheries in the Mid-Atlantic and Chesapeake Bay, in gillnet fisheries in the Mid-Atlantic and elsewhere, and in multispecies, monkfish, spiny dogfish, and northeast sink gillnet fisheries.

In addition to fishery interactions, loggerhead sea turtles also face other man-made threats in the marine environment. These include oil and gas exploration and coastal development, as well as marine pollution, underwater explosions, and hopper dredging. Offshore artificial lighting, power plant entrainment and/or impingement, and entanglement in debris or ingestion of marine debris are also seen as possible threats. Boat collisions and poaching are two direct impacts that affect loggerheads.

9.2.2.3 Other Species of Concern

Barndoor Skate

Barndoor skate is considered a candidate species under the ESA as a result of two petitions to list the species as endangered or threatened that were received in March and April 1999. In June 1999, the agency declared the petitioned actions to be warranted and requested additional information on whether or not to list the species under the ESA. At the 30th Stock Assessment Workshop (SAW 30) held in November 1999, the Stock Assessment Research Committee (SARC) reviewed the status of the barndoor skate stock relative to the five listing criteria of the ESA. The SARC provided their report to the NMFS in the SAW 30 document (NEFSC 2000). NMFS published a decision on the petitions on September 27, 2002 (67FR61055-61061) that the petitioned actions are not warranted at this time. However, NMFS is leaving barndoor skate on the agency's list of candidate species due to remaining uncertainties regarding the status and population structure of the species

The barndoor skate occurs from Newfoundland, the Gulf of St. Lawrence, off Nova Scotia, the Gulf of Maine, and the northern sections of the Mid-Atlantic Bight down to North Carolina. It is one of the largest skates in the Northwest Atlantic and is presumed to be a long-lived, slow growing species. Barndoor skates inhabit mud and sand/gravel bottoms along the continental shelf, generally at depths greater than 150 meters. They are believed to feed on benthic invertebrates and fishes (Bigelow and Schroeder 1953).

The barndoor skate is often caught as a bycatch species in the offshore trawl and sink gillnet fisheries that target multispecies. When landed, barndoor skate are often used in the skate wing fishery.

The abundance of barndoor skate declined continuously through the 1960's. Since 1990, their abundance has increased slightly on Georges Bank, the western Scotian shelf, and in Southern New England, although the current NEFSC autumn survey biomass index is less than 5% of the peak observed in 1963. The species was identified as an overfished species at the SAW 30 (NEFSC 2000). Skates are sensitive to overutilization generally because of their limited reproductive capacity. This is a characteristic of all of the larger species in the Northeast skate complex that are relatively slow-growing, long-lived, and late maturing.

The bulk of the measures being considered in Amendment 13 to the Multispecies FMP are designed to achieve specific fishing mortality reductions for cod, haddock and yellowtail flounder. The tools being considered include effort reduction in all components of the fleet through DAS and TAC restrictions as well as closed areas. Many of these measures are likely to reduce the bycatch of barndoor skate as well.

Therefore, pending the Council's successful achievement of these goals, barndoor skate should not be further depleted by management actions taken under the proposed Amendment 13 to the Multispecies FMP.

9.2.3 Essential Fish Habitat

The area affected by the proposed action has been identified as EFH for species managed under the NE Multispecies; Atlantic Sea Scallop; Atlantic Monkfish; Summer Flounder; Scup and Black Sea Bass; Squid, Atlantic Mackerel and Butterfish; Atlantic Surf Clam and Ocean Quahog; Atlantic Bluefish; Atlantic Billfish; and Atlantic Tuna, Swordfish and Shark Fishery Management Plans. In general, EFH for these species includes pelagic and demersal waters, saltmarsh creeks, seagrass beds, mudflats and open bay areas, as well as mud, sand, gravel and shell sediments over the continental shelf, and structured habitat containing sponges and other biogenic organisms (NMFS 2002). Specific text descriptions and accompanying maps detailing EFH by species and life stage are included in the Omnibus EFH Amendment.

9.2.4 Habitat Associations and Functions

From a biological perspective, habitats provide living things with the basic life requirements of nourishment and shelter. Habitats may also provide a broader range of benefits to the ecosystem. An illustration of the broader context is the way seagrasses physically stabilize the substrate and help recirculate oxygen and nutrients. In this general discussion, we will focus on the primary, direct value of habitats to federally managed species—feeding and shelter from predation.

The spatial and temporal variation of prey abundance influences the survivorship, recruitment, development, and spatial distribution of organisms at every trophic level. For example, phytoplankton abundance and distribution are a great influence on ichthyoplankton community structure and distribution. In addition, the migratory behavior of juvenile and adult fish is directly related to seasonal patterns of prey abundance and changes in environmental conditions, especially water temperature. Prey supply is particularly critical for the starvation-prone early life history stages of fish.

The availability of food for planktivores is highly influenced by oceanographic properties. The seasonal warming of surface waters in temperate latitudes produces vertical stratification of the water column, which isolates sunlit surface waters from deeper, nutrient-rich water, leading to reduced primary productivity. In certain areas, upwelling, induced by wind, storms, and tidal mixing, inject nutrients back into the photic zone, stimulating primary production. Changes in primary production from upwelling and other oceanographic processes affect the amount of organic matter available for other organisms higher up in the food chain, and thus influence their abundance and distribution. Some of the organic matter produced in the photic zone sinks to the bottom and provides food for benthic organisms. In this way, oceanographic properties can also influence the food availability for sessile benthic organisms. In shallower water, benthic macro and microalgae also contribute to primary production. Recent research on benthic primary productivity indicates that benthic microalgae may contribute more to primary production than has been originally estimated (Cahoon 1999).

Benthic organisms provide an important food source for many managed species. Populations of bottom-dwelling sand lance are important food sources for many piscivorous species, and benthic invertebrates are the main source of nutrition for many demersal fishes. Temporal and spatial variations in benthic community structure affect the distribution and abundance of bottom-feeding fish. Likewise, the abundance and species composition of benthic communities are affected by a number of environmental factors including temperature, sediment type, and the amount of organic matter.

A number of recent studies illustrate the research that has addressed habitat associations for demersal juvenile fish. In shallow, nearshore coastal and estuarine waters of the northeast region, effects of physical habitat factors and prey availability on the abundance and distribution of young-of-the-year flounder (various species) have been investigated in nearshore and estuarine habitats in Connecticut, New Jersey, and North Carolina (Phelan et al. 2001, Stoner et al. 2001, Manderson et al. 2000, Howell et al. 1999, Walsh et al. 1999, and Rountree and Able 1992). There are few comparable studies of more open, continental shelf environments. In the northeast U.S., Steves et al. (1989) identified depth, bottom temperature, and time of year as primary factors delineating settlement and nursery habitats for juvenile silver hake and yellowtail flounder in the mid-Atlantic Bight. Also, in a series of publications, Auster et al. (1991, 1995, 1997) correlated the spatial distributions of benthic juvenile fish (e.g. silver hake) with changes in microhabitat type on sand bottom at various open shelf locations in southern New England. In addition to providing food sources, another important functional value of benthic habitat is the shelter and refuge from predators provided by structure. Three dimensional structure is provided by physical features such as boulders, gravel and cobble, sand waves and ripples, and mounts, burrows and depressions created by organisms. Structure is also provided by emergent epifauna.

The importance of benthic habitat complexity was discussed by Auster (1998a) and Auster and Langton (1999) in the context of providing a conceptual model to visualize patterns in fishing gear impacts across a gradient of habitat types. Based on this model, habitat value increases with increased structural complexity, from the lowest value in flat sand and mud to the highest value in piled boulders. The importance of habitat complexity to federally managed species is a key issue in the Northeast region.

9.2.4.1 Biological Characteristics of Regional Systems

9.2.4.1.1 Gulf of Maine

The Gulf of Maine's geologic features, when coupled with the vertical variation in water properties, result in a great diversity of habitat types. The greatest number of invertebrates in this region are classified as mollusks, followed by annelids, crustaceans, echinoderms and other (Theroux and Wigley 1998). By weight, the order of taxa changes to echinoderms, mollusks, other, annelids and crustaceans. Watling (1998) used numerical classification techniques to separate benthic invertebrate samples into seven types of bottom assemblages. These assemblages are identified in Table 382 and their distribution is depicted in Figure 229. This classification system considers benthic assemblage, substrate type and water properties.

An in-depth review of GOM habitat types has been prepared by Brown (1993). Although still preliminary, this classification system is a promising approach. It builds on a number of other schemes, including Cowardin et al. (1979), and tailors them to Maine's marine and estuarine environments. A significant factor that is included in this review (but has been neglected in others) is a measure of "energy" in a habitat. Energy could be a reflection of wind, waves, or currents present. This is a particularly important consideration in a review of fishing gear impacts since it indicates the natural disturbance regime of a habitat. The amount and type of natural disturbance is in turn an indication of the habitat's resistance to and recoverability from disturbance by fishing gear. Although this work appears to be complete in its description of habitat types, unfortunately, the distribution of many of the habitats are unknown.

Demersal fish assemblages for the Gulf of Maine and Georges Bank were part of broad scale geographic investigations conducted by Mahon et al. (1998) and Gabriel (1992). Both these studies and a more limited study by Overholtz and Tyler (1985) found assemblages that were consistent over space and time in this region. In her analysis, Gabriel found that the most persistent feature over time in assemblage structure from Nova Scotia to Cape Hatteras was the boundary separating assemblages between the Gulf of Maine and Georges Bank, which occurred at approximately the 100 m isobath on northern Georges Bank.

Overholtz & Tyler (1985) identified five assemblages for this region (Table 383). The Gulf of Maine-deep assemblage included a number of species found in other assemblages, with the exception of American plaice and witch flounder, which was unique to this assemblage. Gabriel's approach did not allow species to co-occur in assemblages, and also classified these two species as unique to the deepwater Gulf of Maine-Georges Bank assemblage. Results of these two studies are compared in Table 383. Auster et al. (2001) went a step further, and related species clusters on Stellwagen Bank to reflectance values of different substrate types in an attempt to use fish distribution as a proxy for seafloor habitat distribution. They found significant reflectance associations for twelve of 20 species, including American plaice (fine substrate), and haddock (coarse substrate). Species clusters and associated substrate types are given in Table 384.

Benthic Assemblage	Benthic Community Description
1	Comprises all sandy offshore banks, most prominently Jeffreys Ledge, Fippennies Ledge, and Platts Bank; depth on top of banks about 70 m; substrate usually coarse sand with some gravel; fauna characteristically sand dwellers with an abundant interstitial component.
2	Comprises the rocky offshore ledges, such as Cashes Ledge, Sigsbee Ridge and Three Dory Ridge; substrate either rock ridge outcrop or very large boulders, often with a covering of very fine sediment; fauna predominantly sponges, tunicates, bryozoans, hydroids, and other hard bottom dwellers; overlying water usually cold Gulf of Maine Intermediate Water.
3	Probably extends all along the coast of the Gulf of Maine in water depths less than 60 m; bottom waters warm in summer and cold in winter; fauna rich and diverse, primarily polychaetes and crustaceans; probably consists of several (sub-) assemblages due to heterogeneity of substrate and water conditions near shore and at mouths of bays.
4	Extends over the soft bottom at depths of 60 to 140 m, well within the cold Gulf of Maine Intermediate Water; bottom sediments primarily fine muds; fauna dominated by polychaetes, shrimp, and cerianthid anemones.
5	A mixed assemblage comprising elements from the cold water fauna as well as a few deeper water species with broader temperature tolerances; overlying water often a mixture of Intermediate Water and Bottom Water, but generally colder than 7° C most of the year; fauna sparse, diversity low, dominated by a few polychaetes, with brittle stars, sea pens, shrimp, and cerianthid also present.
6	Comprises the fauna of the deep basins; bottom sediments generally very fine muds, but may have a gravel component in the offshore morainal regions; overlying water usually 7 to 8° C, with little variation; fauna shows some bathyal affinities but densities are not high, dominated by brittle stars and sea pens, and sporadically by a tube-making amphipod.
7	The true upper slope fauna that extends into the Northeast Channel; water temperatures are always above 8° and salinities are at least 35 ppt; sediments may be either fine muds or a mixture of mud and gravel.

Table 382 - Gulf of Maine benthic assemblages as identified by Watling (1998).

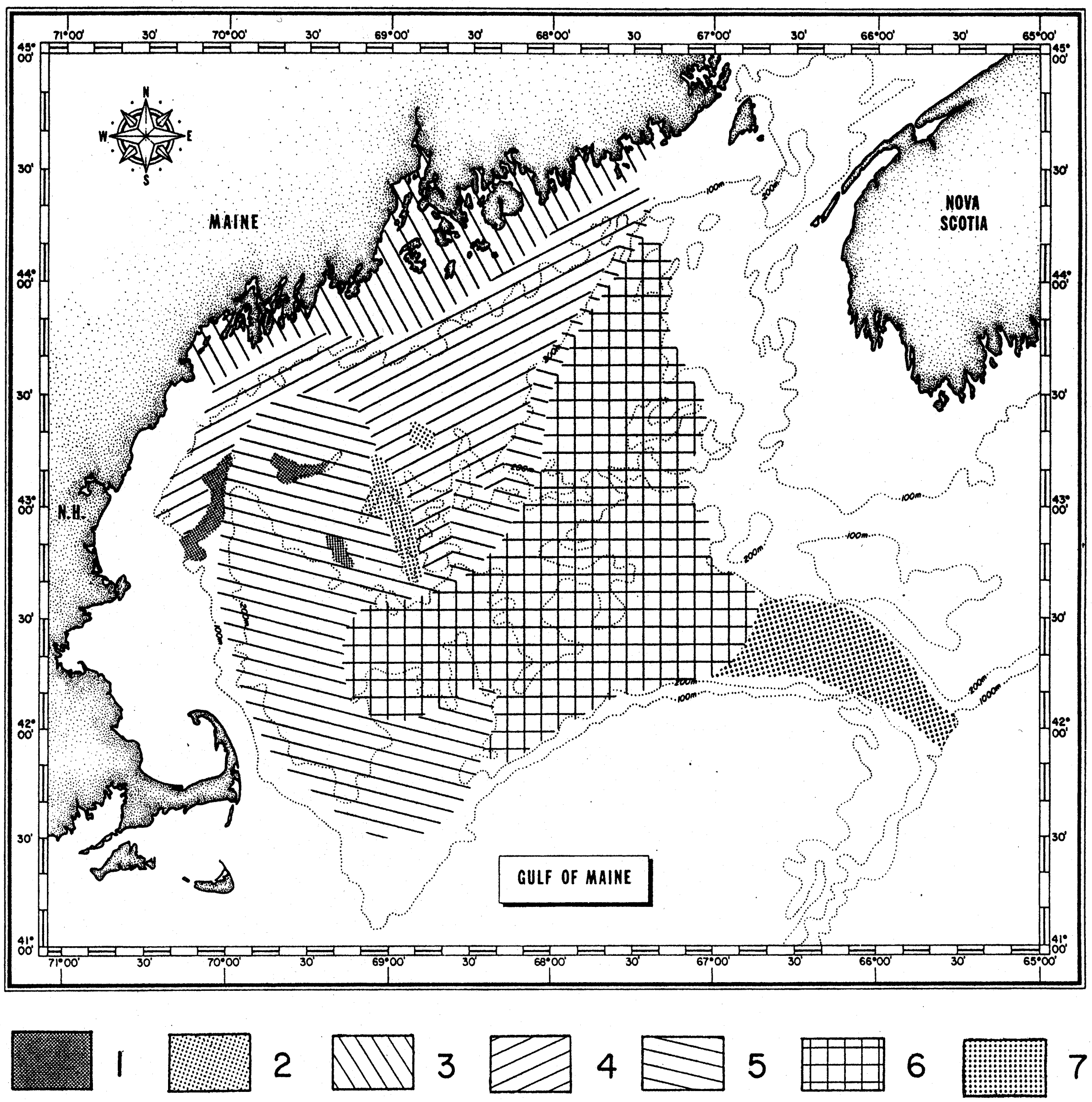


Figure 229 - Distribution of the seven major benthic assemblages in the Gulf of Maine as determined from both soft bottom quantitative sampling and qualitative hard bottom sampling.
The assemblages are characterized as follows: 1. Sandy offshore banks; 2. Rocky offshore ledges; 3. Shallow (<50 m) temperate bottoms with mixed substrate; 4. Boreal muddy bottom, overlain by Maine Intermediate Water, 50 – 160 m (approx.); 5. Cold deep water, species with broad tolerances, muddy bottom; 6. Deep basin warm water, muddy bottom; 7. Upper slope water, mixed sediment. Source: Watling 1998.

Overholtz & Tyler (1984)		**Gabriel (1992)**	
Assemblage	**Species**	**Species**	**Assemblage**
Slope & Canyon	offshore hake blackbelly rosefish Gulf stream flounder fourspot flounder monkfish, whiting white hake, red hake	offshore hake blackbelly rosefish Gulf stream flounder fawn cusk-eel, longfin hake, armored sea robin	**Deepwater**
Intermediate	whiting red hake monkfish Atlantic cod, haddock, ocean pout, yellowtail flounder, winter skate, little skate, sea raven, longhorn sculpin	whiting red hake monkfish short-finned squid, spiny dogfish, cusk	**Combination of Deepwater Gulf of Maine/Georges Bank & Gulf of Maine-Georges Bank Transition**
Shallow	Atlantic cod haddock pollock whiting white hake red hake monkfish ocean pout yellowtail flounder windowpane winter flounder winter skate little skate longhorn sculpin summer flounder sea raven, sand lance	Atlantic cod haddock pollock yellowtail flounder windowpane winter flounder winter skate little skate longhorn sculpin	**Gulf of Maine-Georges Bank Transition Zone** **Shallow Water Georges Bank-Southern New England**
Gulf of Maine-Deep	white hake American plaice witch flounder thorny skate whiting, Atlantic cod, haddock, cusk Atlantic wolffish	white hake American plaice witch flounder thorny skate, redfish	**Deepwater Gulf of Maine-Georges Bank**
Northeast Peak	Atlantic cod haddock pollock ocean pout, winter flounder, white hake, thorny skate, longhorn sculpin	Atlantic cod haddock pollock	**Gulf of Maine-Georges Bank Transition Zone**

Table 383 - Comparison of demersal fish assemblages of Georges Bank and Gulf of Maine identified by Overholtz and Tyler (1985) and Gabriel (1992).
Gabriel analyzed a greater number of species and did not overlap assemblages.

SUBSTRATE TYPE									
Coarse		**Coarse**		**Wide Range**		**Fine**		**Fine**	
Species	**Mean**	**Species**	**Mean**	**Species**	**Mean**	**Species**	**Mean**	**Species**	**Mean**
Northern Sand	1172.0	Haddock	13.1	American plaice	63.3	American plaice	152.0	Whiting	275.0
Lance	72.2	Atlantic cod	7.3	Northern sand	53.0	Acadian redfish	31.3	American plaice	97.1
Atlantic herring	38.4	American plaice	5.3	lance	28.5	Whiting	29.5	Atlantic mackerel	42.0
Spiny dogfish	37.4	Whiting	3.3	Atlantic herring	22.4	Atlantic herring	28.0	Pollock	41.1
Atlantic cod	29.7	Longhorn sculpin	2.0	Whiting	16.0	Red hake	26.1	Alewife	37.2
Longhorn sculpin	28.0	Yellowtail flounder	1.9	Acadian redfish	14.0	Witch flounder	23.8	Atlantic herring	32.0
American plaice	25.7	Spiny dogfish	1.6	Atlantic cod	9.5	Atlantic cod	13.1	Atlantic cod	18.1
Haddock	20.2	Acadian redfish	1.6	Longhorn sculpin	9.1	Haddock	12.7	Longhorn sculpin	16.8
Yellowtail flounder	7.5	Ocean pout	1.3	Haddock	7.9	Longhorn sculpin	12.5	Red hake	15.2
Whiting	9.0	Alewife	1.1	Pollock	6.2	Daubed shanney	11.4	Haddock	13.2
Ocean pout		**No. tows = 60**		Red hake		**No. tows = 66**		**No. tows = 20**	
No. tows = 83				**No. tows = 159**					

Table 384 - Ten dominant species and mean abundance/tow^{-1} from each cluster species group and its associated substrate type as determined by reflectance value, from Stellwagen Bank, Gulf of Maine (Auster et al. 2001).

9.2.4.1.2 Georges Bank

The interaction of several environmental factors including availability and type of sediment, current speed and direction, and bottom topography have been found to combine to form seven sedimentary provinces on eastern Georges Bank (Valentine et al. 1993), which are outlined in Table 385 and depicted in Figure 230.

Theroux and Grosslein (1987) identified four macrobenthic invertebrate assemblages that corresponded with previous work in the geographic area. They noted that it is impossible to define distinct boundaries between assemblages because of the considerable intergrading that occurs between adjacent assemblages; however, the assemblages are distinguishable. Their assemblages are associated with those identified by Valentine et al. (1993) in Table 385.

The Western Basin assemblage (Theroux and Grosslein 1987) is found in the upper Great South Channel region at the northwestern corner of the bank, in comparatively deep water (150-200 m) with relatively slow currents and fine bottom sediments of silt, clay and muddy sand. Fauna are comprised mainly of small burrowing detritivores and deposit feeders, and carnivorous scavengers. Representative organisms include bivalves (*Thyasira flexuosa, Nucula tenuis, Musculus discors*), annelids (*Nephtys incisa, Paramphinome pulchella, Onuphis opalina, Sternaspis scutata*), the brittle star (*Ophiura sarsi*), the amphipod *Haploops tubicola*, and red crab (*Geryon quedens*). Valentine et al. 1993 did not identify a comparable assemblage; however, this assemblage is geographically located adjacent to Assemblage 5 as described by Watling (1998) (Table 382**,** Figure 229).

The Northeast Peak assemblage is found along the Northern Edge and Northeast Peak, which varies in depth and current strength and includes coarse sediments, mainly gravel and coarse sand with interspersed boulders, cobbles and pebbles. Fauna tend to be sessile (coelenterates, brachiopods, barnacles, and tubiferous annelids) or free-living (brittlestars, crustaceans and polychaetes), with a characteristic absence of burrowing forms. Representative organisms include amphipods (*Acanthonotozoma serratum, Tiron spiniferum*), the isopod *Rocinela americana*, the barnacle *Balanus hameri*, annelids (*Harmothoe imbricata, Eunice pennata, Nothria conchylega,* and *Glycera capitata*), sea scallops (*Placopecten magellanicus*), brittlestars (*Ophiacantha bidentata, Ophiopholis aculeata*), and soft corals (*Primnoa resedaeformis, Paragorgia arborea*).

The Central Georges assemblage occupies the greatest area, including the central and northern portions of the bank in depths less than 100 m. Medium grained shifting sands predominate this dynamic area of strong currents. Organisms tend to be small to moderately large in size with burrowing or motile habits. Sand dollars (*Echinarachnius parma*) are most characteristic of this assemblage. Other representative species include mysids (*Neomysis americana, Mysidopsis bigelowi*), the isopod *Chiridotea tuftsi*, the cumacean *Leptocuma minor*, the amphipod *Protohaustorius wigleyi*, annelids (*Sthenelais limicola, Goniadella gracilis, Scalibregma inflatum*), gastropods (*Lunatia heros*, *Nassarius trivittatus*), the starfish *Asterias vulgaris*, the shrimp *Crangon septemspinosa* and the crab *Cancer irroratus*.

The Southern Georges assemblage is found on the southern and southwestern flanks at depths from 80 m to 200 m, where fine grained sands and moderate currents predominate. Many southern species exist here at the northern limits of their range. Dominant fauna include amphipods, copepods, euphausiids and starfish genus *Astropecten*. Representative organisms include amphipods (*Ampelisca compressa, Erichthonius rubricornis, Synchelidium americanum*), the cumacean *Diastylis quadrispinosa*, annelids (*Aglaophamus circinata, Nephtys squamosa, Apistobranchus tullbergi*), crabs (*Euprognatha rastellifera, Catapagurus sharreri*) and the shrimp *Munida iris*.

Sedimentary Province	Depth (m)	Description	Benthic Assemblage
Northern Edge / Northeast Peak (1)	40-200	Dominated by gravel with portions of sand, common boulder areas, and tightly packed pebbles. Representative epifauna (bryozoa, hydrozoa, *anemones,*and *calcareous* worm tubes) are abundant in areas of boulders. *Strong tidal and storm currents.*	Northeast Peak
Northern Slope & Northeast Channel (2)	200-240	Variable sediment type (gravel, gravel-sand, and sand) scattered bedforms. This is a transition zone between the northern edge and southern slope. *Strong tidal and storm currents.*	Northeast Peak
North / Central Shelf (3)	60-120	Highly variable sediment type (ranging from gravel to sand) with rippled sand, large bedforms, and patchy gravel lag deposits. *Minimal epifauna on gravel due to sand movement. Representative epifauna in sand areas include amphipods, sand dollars, and burrowing anemones.*	Central Georges
Central & Southwestern Shelf - *shoal ridges* (4)	10-80	Dominated by sand (fine and medium grain) with large sand ridges, dunes, waves, and ripples. Small bedforms in southern part. *Minimal epifauna on gravel due to sand movement. Representative epifauna in sand areas include amphipods, sand dollars, and burrowing anemones.*	Central Georges
Central & Southwestern Shelf - *shoal troughs* (5)	40-60	Gravel (including gravel lag) and gravel-sand between large sand ridges. Patch large bedforms. Strong currents. (Few samples – submersible observation noted presence of gravel lag, rippled gravel-sand, and large bedforms.) *Minimal epifauna on gravel due to sand movement. Representative epifauna in sand areas include amphipods, sand dollars, and burrowing anemones.*	Central Georges
Southeastern Shelf (6)	80-200	Rippled gravel-sand (medium and fine-grained sand) with patchy large bedforms and gravel lag. Weaker currents; *ripples are formed by intermittent storm currents. Representative epifauna include sponges attached to shell fragments and amphipods.*	Southern Georges
Southeastern Slope (7)	400-2000	Dominated by silt and clay with portions of sand (medium and fine) with rippled sand on shallow slope and smooth silt-sand deeper.	none

Table 385 - Sedimentary provinces of Georges Bank, as defined by Valentine *et al.* (1993) and Valentine and Lough (1991) with additional comments by Valentine (personal communication) and Benthic Assemblages assigned from Theroux and Grosslein (1987).

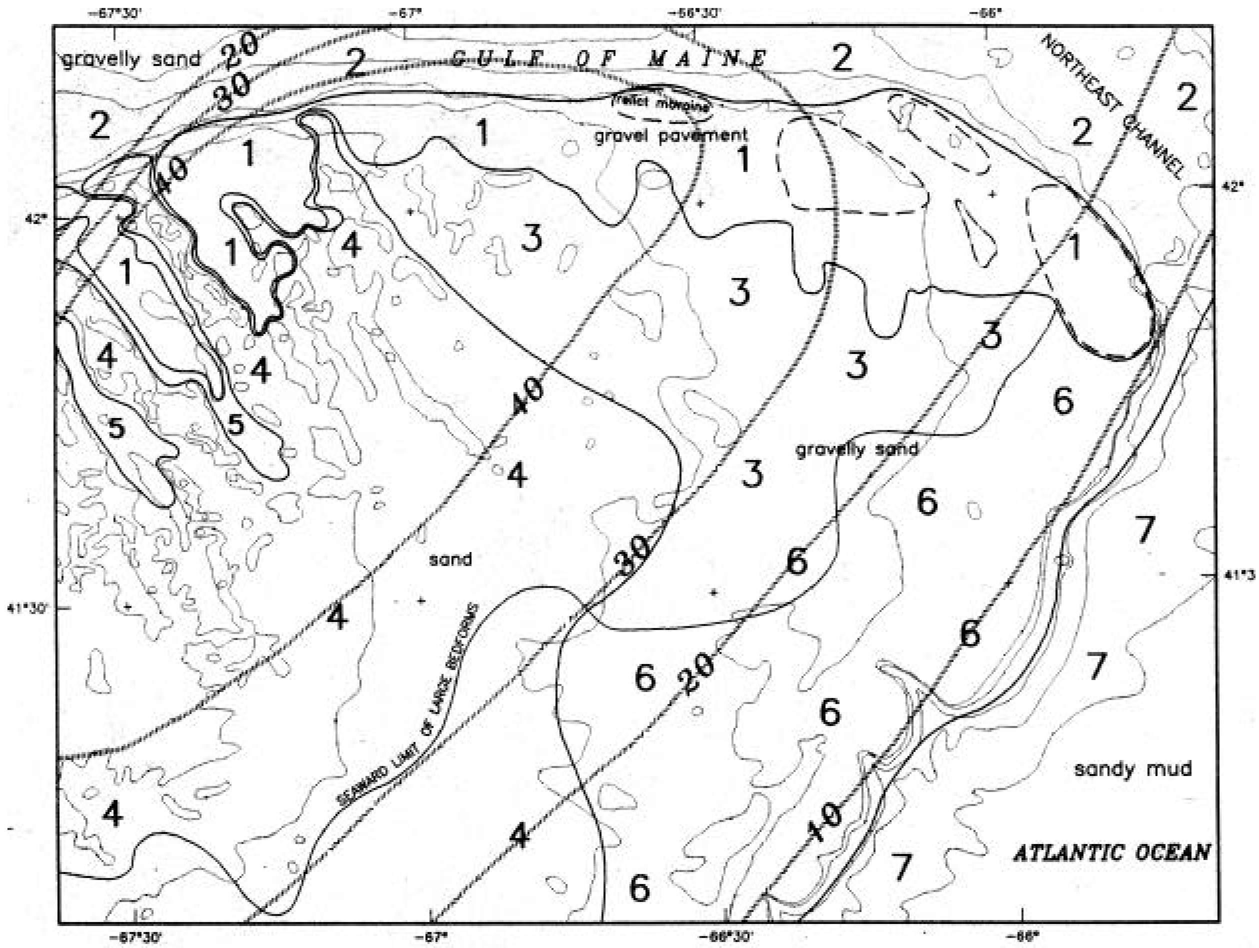


Figure 230 - Sedimentary provinces of eastern Georges Bank based on criteria of sea floor morphology, texture, sediment movement and bedforms, and mean tidal bottom current speed (cm/sec).

Relict moraines (bouldery sea floor) are enclosed by dashed lines. Source: Valentine and Lough (1991).

Along with high levels of primary productivity, Georges Bank has been historically characterized by high levels of fish production. Several studies have attempted to identify demersal fish assemblages over large spatial scales. Overholtz and Tyler (1985) found five depth-related groundfish assemblages for Georges Bank and the Gulf of Maine that were persistent temporally and spatially. Depth and salinity were identified as major physical influences explaining assemblage structure. Gabriel identified six assemblages, which are compared with the results of Overholtz & Tyler (1984) in Table 383. Mahon et al. (1998) found similar results.

A few recent studies (Garrison 2000, Garrison and Link 2000, Garrison 2001) demonstrate the persistence of spatio-temporal overlap among numerically dominant, commercially valuable and /or ecologically important species. The studies by Garrison and associates utilized an index of spatial overlap based on the NOAA spring and fall surveys. He found that among the community of fish species on Georges Bank, only a very few species have high spatial overlaps with other species. The most notable example is silver hake (whiting), which had a very high overlap with most other species, suggestive of a broad distribution. Trends in spatial overlap over time generally reflect changes in species abundance. During the 1960s, haddock and yellowtail flounder were both widely distributed and had high spatial overlaps with other species. As abundance of these species declined through the 1970s into the 1990s, their spatial range contracted and their overlaps with other species subsequently declined. In contrast to this, species whose abundance has increased through time show an expansion of ranges and increased spatial overlap with other species. Interestingly and to confirm other studies of fish assemblages, the major species assemblages have been generally consistent across time given the changes in relative abundance.

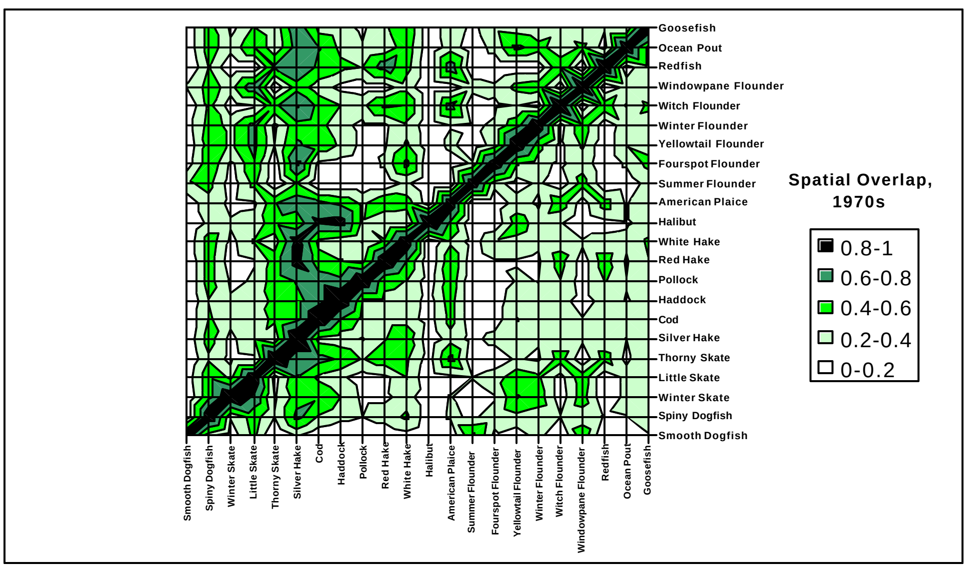


Figure 231 - Spatial overlap of primary finfish species on Georges Bank, 1970s (as modified from Garrison and Link 2000)

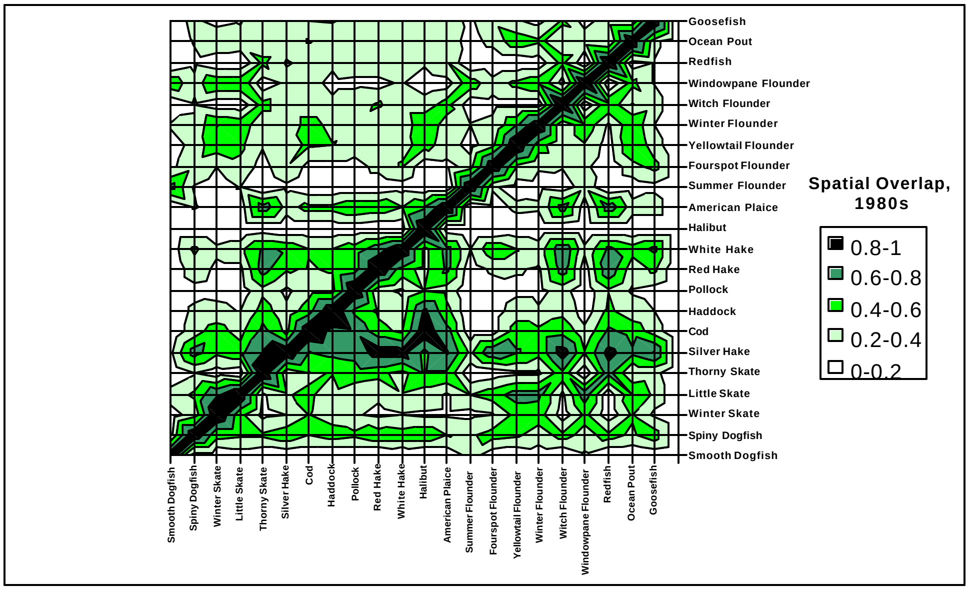


Figure 232 - Spatial overlap of primary finfish species on Georges Bank, 1980s (as modified from Garrison and Link 2000)

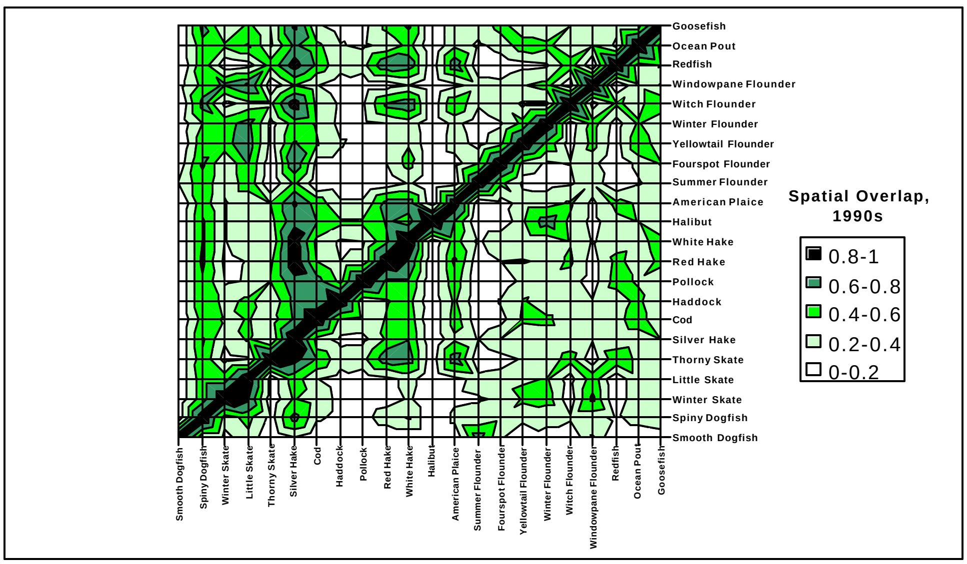


Figure 233 - Spatial overlap of primary finfish species on Georges Bank, 1990s (as modified from Garrison and Link 2000)

Seasonal trends in spatial overlap are also apparent. Spiny dogfish, for example, has a far stronger association and a far broader range of species' associations in the winter than it does in the summer. Similarly, winter skate is a more prevalent co-correspondent in winter than other times of the year. This metric, like the spatial overlap trend over time (above), is sensitive to abundance as evidenced by the lack of spatial overlap between Atlantic halibut and any other species.

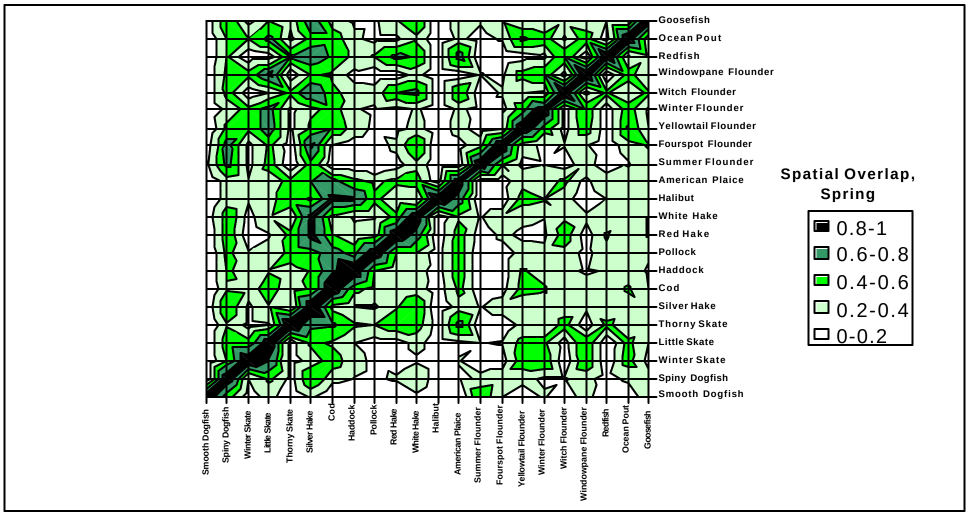


Figure 234 - Spatial overlap of primary finfish species on Georges Bank, spring 1970-1998 (as modified from Garrison and Link 2000)

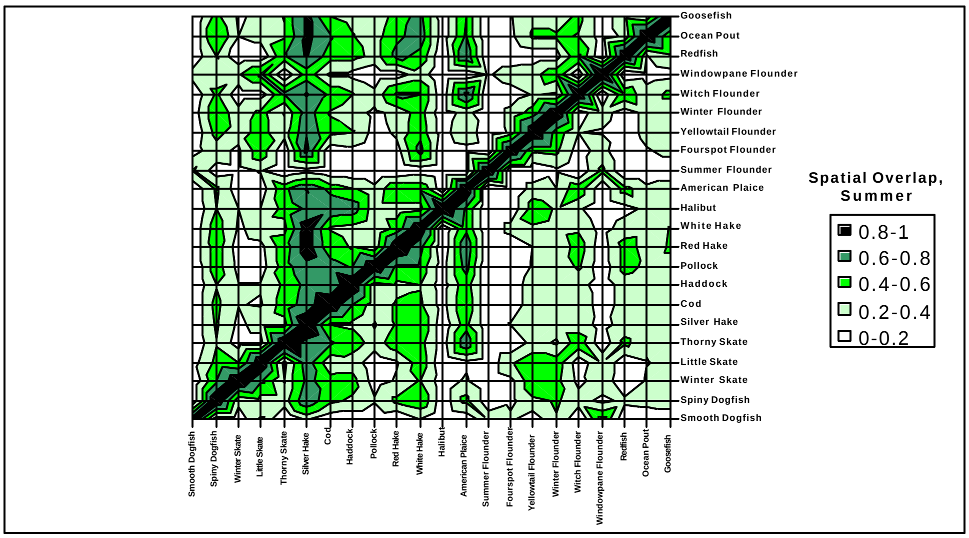


Figure 235 - Spatial overlap of primary finfish species on Georges Bank, Summer 1970-1998 (as modified from Garrison and Link 2000)

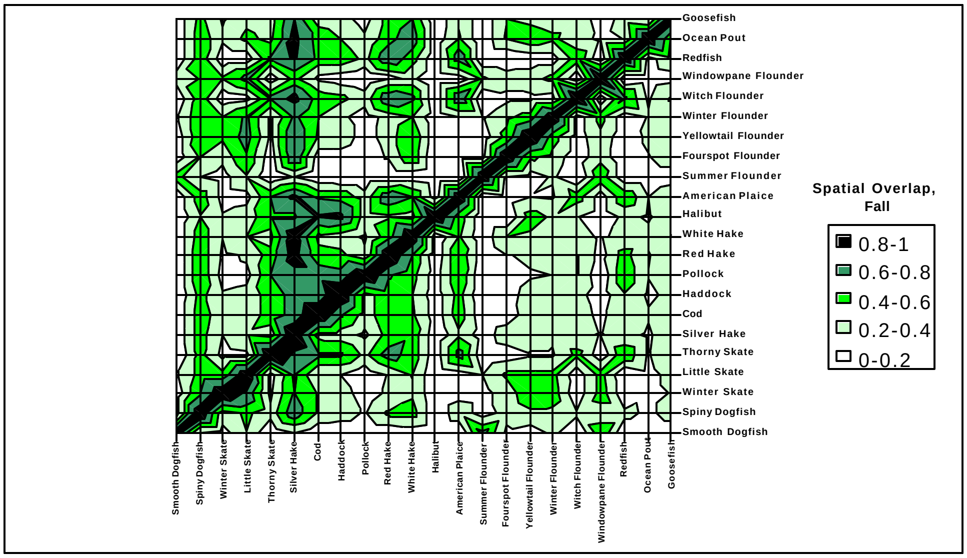


Figure 236 - Spatial overlap of primary finfish species on Georges Bank, fall 1970-1998 (as modified from Garrison and Link 2000)

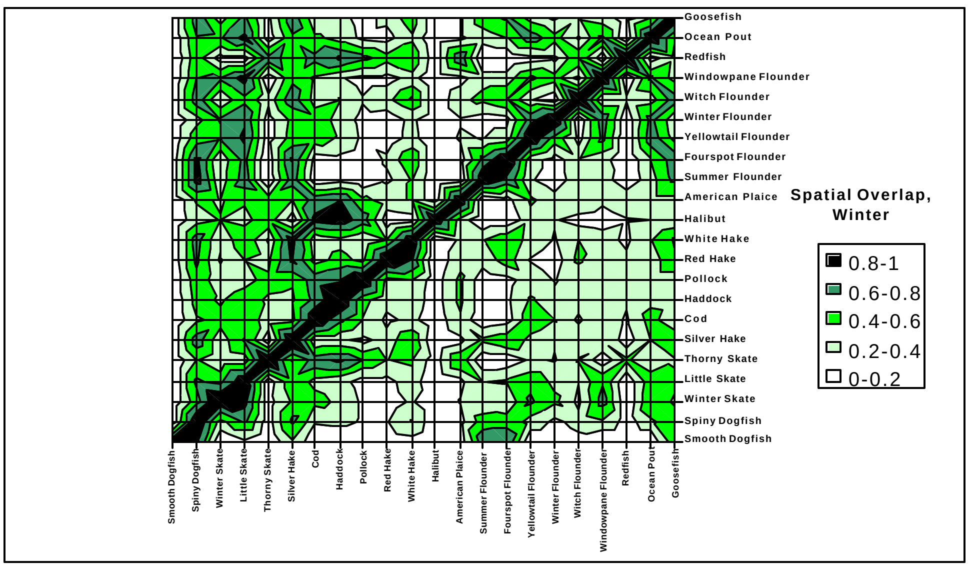


Figure 237 - Spatial overlap of primary finfish species on Georges Bank, winter 1970-1998 (as modified from Garrison and Link 2000)

9.2.4.1.3 Mid-Atlantic Bight

Three broad faunal zones related to water depth and sediment type were identified for the Mid-Atlantic by Pratt (1973). The "sand fauna" zone was defined for sandy sediments (1% or less silt) which are at least occasionally disturbed by waves, from shore out to 50 m. The "silty sand fauna" zone occurred immediately offshore from the sand fauna zone, in stable sands containing at least a few percent silt and slightly more (2%) organic material. Silts and clays become predominant at the shelf break and line the Hudson Shelf Valley, and support the "silt-clay fauna."

Building on Pratt's work, the Mid-Atlantic shelf was further divided by Boesch (1979) into seven bathymetric/morphologic subdivisions based on faunal assemblages (Table 386, Figure 238). Sediments in the region studied (Hudson Shelf Valley south to Chesapeake Bay) were dominated by sand with little finer material. Ridges and swales are important morphological features in this area. Sediments are coarser on the ridges, and the swales have greater benthic macrofaunal density, species richness and biomass. Faunal species composition differed between these features, and Boesch incorporated this variation in his subdivisions (Table 386). Much overlap of species distributions was found between depth zones, so the faunal assemblages represented more of a continuum than distinct zones.

Habitat Type (after Boesch 1979)	**Description**		
	Depth (m)	**Characterization (Pratt faunal zone)**	**Characteristic Benthic Macrofauna**
Inner shelf	0-30	characterized by coarse sands with finer sands off MD and VA (sand zone)	Polychaetes: *Polygordius, Goniadella, Spiophanes*
Central shelf	30-50	(sand zone)	Polychaetes: *Spiophanes, Goniadella* Amphipod: *Pseudunciola*
Central and inner shelf swales	0-50	occurs in swales between sand ridges (sand zone)	*Polychaetes:* Spiophanes, Lumbrineris, Polygordius
Outer shelf	50-100	(silty sand zone)	Amphipods: *Ampelisca vadorum, Erichthonius* Polychaetes: *Spiophanes*
Outer shelf swales	50-100	occurs in swales between sand ridges (silty sand zone)	Amphipods: *Ampelisca agassizi, Unciola, Erichthonius*
Shelf break	100-200	(silt-clay zone)	not given
Continental slope	>200	(none)	not given

Table 386 - Mid-Atlantic habitat types as described by Pratt (1973) and Boesch (1979) with characteristic macrofauna as identified in Boesch 1979.

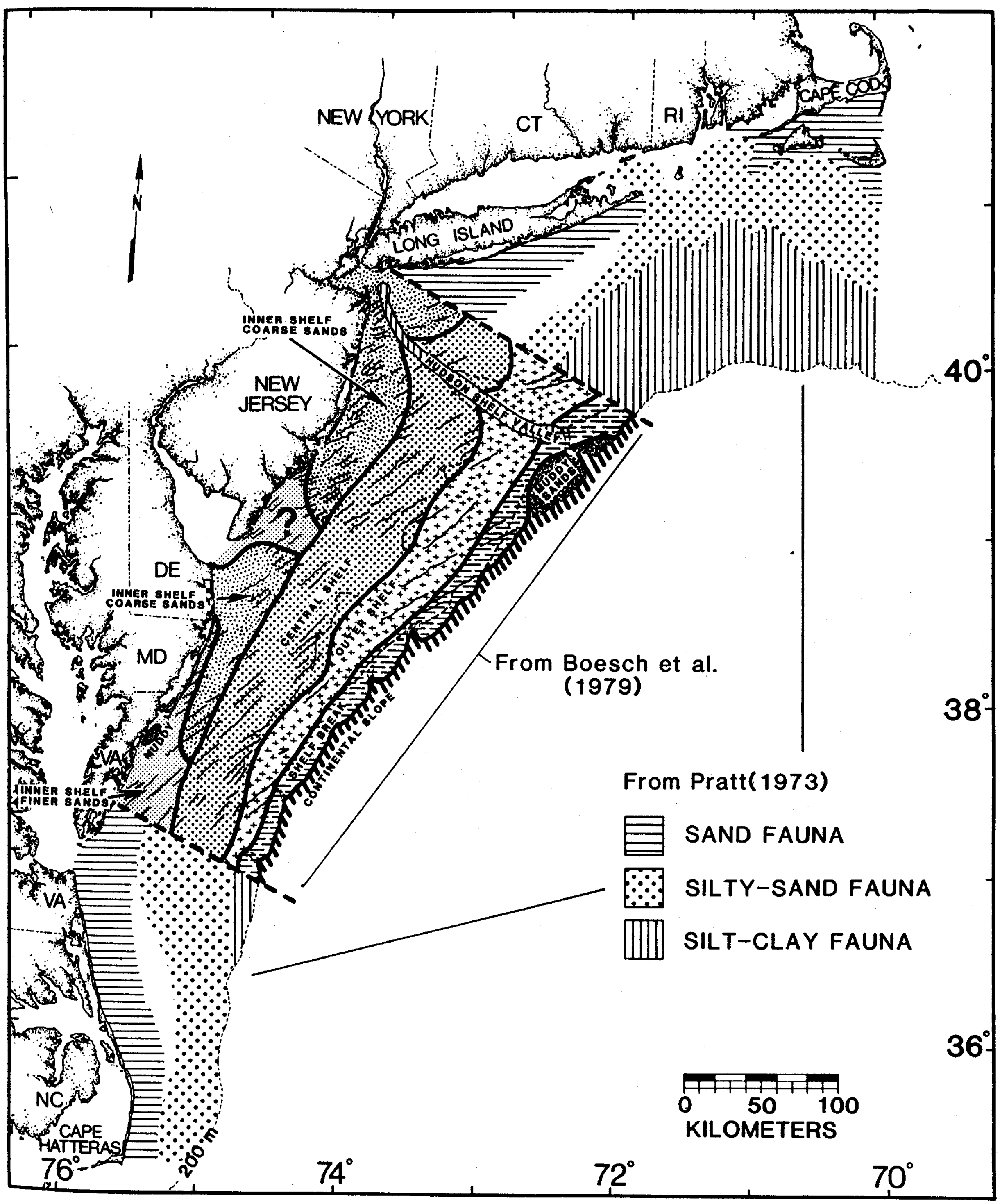


Figure 238 - Schematic representation of major macrofaunal zones on the Mid-Atlantic shelf.
Approximate location of ridge fields indicated. Source: Reid and Steimle (1988).

Wigley and Theroux (1981) found a general trend in declining macrobenthic invertebrate density from coastal areas offshore to the slope, and on the shelf from southern New England south to Virginia/North Carolina. There were no detectable trends in density from north to south on the slope. Number of individuals was greatest in gravel sediments, and declined in sand-gravel, sand-shell, sand, shell, silty sand, silt and finally clay. However, biomass of benthic macrofauna was greatest in shell habitat, followed by silty sand, gravel, sand-gravel, sand, sand-shell, silt and clay.

Demersal fish assemblages were described at a broad geographic scale for the continental shelf and slope from Cape Chidley, Labrador to Cape Hatteras, North Carolina (Mahon *et al.* 1998) and from Nova Scotia to Cape Hatteras (Gabriel 1992). Factors influencing species distribution included latitude and depth.

Results of these studies were similar to an earlier study confined to the Mid-Atlantic Bight continental shelf (Colvocoresses and Musick 1983). In this study, there were clear variations in species abundances, yet they demonstrated consistent patterns of community composition and distribution among demersal fishes of the Mid-Atlantic shelf. This is especially true for five strongly recurring species associations that varied slightly by season (Table 387). The boundaries between fish assemblages generally followed isotherms and isobaths. The assemblages were largely similar between the spring and fall collections, with the most notable change being a northward and shoreward shift in the temperate group in the spring.

Season	Species Assemblage				
	Boreal	Warm temperate	Inner shelf	Outer shelf	Slope
Spring	Atlantic cod little skate sea raven monkfish winter flounder longhorn sculpin ocean pout whiting red hake white hake spiny dogfish	black sea bass summer flounder butterfish scup spotted hake northern searobin	windowpane	fourspot flounder	shortnose greeneye offshore hake blackbelly rosefish white hake
Fall	white hake whiting red hake monkfish longhorn sculpin winter flounder yellowtail flounder witch flounder little skate spiny dogfish	black sea bass summer flounder butterfish scup spotted hake northern searobin smooth dogfish	windowpane	fourspot flounder fawn cusk eel gulf stream flounder	shortnose greeneye offshore hake blackbelly rosefish white hake witch flounder

Table 387 - Major Recurrent Demersal Finfish Assemblages of the Mid-Atlantic Bight During Spring and Fall as Determined by Colvocoresses and Musik (1983).

Steimle and Zetlin (2000) described representative finfish species and epibenthic/epibiotic and motile epibenthic invertebrates associated with mid-Atlantic reef habitats (Table 388). Most of these reefs are human-made structures.

Location (Type)	**Representative Flora & Fauna**		
	Epibenthic/Epibiotic	**Motile Epibenthic Invertebrates**	**Fish**
Estuarine (Oyster reefs, blue mussel beds,other hard surfaces, semi-hard clay and Spartina peat reefs)	Oyster, barnacles, ribbed mussel, blue mussel, algae, sponges, tube worms, anemones, hydroids, bryozoans, slipper shell, jingle shell, northern stone coral, sea whips, tunicates, caprellid amphipods, wood borers	Xanthid crabs, blue crab, rock crabs, spider crab, juvenile American lobsters, sea stars	Gobies, spot, striped bass, black sea bass, white perch, toadfish, scup, drum, croaker, spot, sheepshead porgy, pinfish, juvenile and adult tautog, pinfish, northern puffer, cunner, sculpins, juvenile and adult Atlantic cod, rock gunnel, conger eel, American eel, red hake, ocean pout, white hake, juvenile pollock
Coastal (exposed rock/soft marl, harder rock, wrecks & artificial reefs, kelp, other materials)	Boring mollusks (piddocks), red algae, sponges, anemones, hydroids, northern stone coral, soft coral, sea whips, barnacles, blue mussel, horse mussel, bryozoans, skeleton and tubiculous amphipods, polychaetes, jingle shell, sea stars	American lobster, Jonah crab, rock crabs, spider crab, sea stars, urchins, squid egg clusters	Black sea bass, pinfish, scup, cunner, red hake, gray triggerfish, black brouper, smooth dogfish, sumemr flounder, scad, bluefish amberjack, Atlantic cod, tautog, ocean pout, conger eel, sea raven, rock gunnel, radiated shanny
Shelf (rocks & boulders, wrecks & artificial reefs, other solid substrates)	Boring mollusks (piddocks) red algae, sponges, anemones, hydroids, stone coral, soft coral, sea whips, barnacles, blue mussels, horse mussels, bryozoans, amphipods, polychaetes	American lobster, Jonah crabs, rock crabs, spider crabs, sea stars, urchins, squid egg clusters (with addition of some deepwater taxa at shelf edge)	Black sea bass, scup, tautog, cunner, gag, sheepshead porgy, round herring, sardines, amberjack, spadefish, gray triggerfish, mackerels, small tunas, spottail pinfish, tautog, Atlantic cod, ocean pout, red hake, conger eel, cunner, sea raven, rock gunnel, pollock, white hake
Outer shelf (reefs and clay burrows including “pueblo village community”)			Tilefish, white hake, conger eel

Table 388 - Mid-Atlantic Reef Types, Location, and Representative Flora and Fauna, as Described in Steimle and Zetlin (2000)

9.2.4.1.4 Continental Slope

Polychaetes represent the most important slope faunal group in terms of numbers of individuals and species (Wiebe et al. 1987). Ophiuroids are considered to be among the most abundant slope organisms, but this group is comprised of relatively few species. The taxonomic group with the highest species diversity includes the peracarid crustaceans represented by Amphipoda, Cumacea, Isopoda, and the Tanaidacea. Some species of the slope are widely distributed, while others appear to be restricted to particular ocean basins. The ophiuroids and bivalves appear to have the broadest distributions, while the peracarid crustaceans appear to be highly restricted because they brood their young, and lack a planktonic stage of development. In general, gastropods do not appear to be very abundant, however, past studies are inconclusive since they have not collected enough individuals for large-scale community and population studies.

In general, slope-inhabiting benthic organisms are strongly zoned by depth and/or water temperature, although these patterns are modified by the presence of topography, including canyons, channels, and current zonations (Hecker 1990). Moreover, at depths of less than 800 meters, the fauna is extremely variable and the relationships between faunal distribution and substrate, depth, and geography are less obvious (Wiebe et al. 1987). Fauna occupying hard-surface sediments are not as dense as in comparable shallow-water habitats (Wiebe et al. 1987), but there is an increase in species diversity from the shelf to the intermediate depths of the slope. Diversity then declines again in the deeper waters of the continental rise and plain. Hecker (1990) identified four megafaunal zones on the slope of Georges Bank and southern New England (Table 389).

Zone	Approximate Depth (m)	Gradient	Current	Fauna
Upper Slope	300-700	Low	strong	Dense filter feeders; Scleratinians (*Dasmosmilia lymani, Flabellum alabastrum*), quill worm (*Hyalinoecia*)
Upper Middle Slope	500-1300	High	moderate	Sparse scavengers; red crab (*Geryon quinqueidens*), long-nosed eel (*Synaphobranchus*), common grenadier (*Nezumia*). Alcyonarians (*Acanella arbuscula*, *Eunephthya florida*) in areas of hard substrate
Lower Middle Slope/Transition	1200-1700	High	moderate	Sparse suspension feeders; cerianthids, sea pen (*Distichoptilum gracile*)
Lower Slope	>1600	Low	strong	Dense suspension & deposit feeders; ophiurid (*Ophiomusium lymani*), cerianthid, sea pen

Table 389 - Faunal zones of the continental slope of Georges Bank and southern New England (from Hecker 1990)

One group of organisms of interest because of the additional structure they can provide for habitat and their potential long life span are the Alcyonarian soft corals. Soft corals can be bush or treelike in shape; species found in this form attach to hard substrates such as rock outcrops or gravel. These species can range in size from a few millimeters to several meters, and the trunk diameter of large specimens can exceed 10 cm. Other Alcyonarians found in this region include sea pens and sea pansies (Order Pennatulacea), which are found in a wider range of substrate types. In their survey of northeastern U.S. shelf macrobenthic invertebrates, Theroux and Wigley (1998) found Alcyonarians (including soft corals *Alcyonium sp., Acanella sp., Paragorgia arborea, Primnoa reseda* and sea pens) in limited numbers in waters deeper than 50 m, and mostly at depths from 200-500 m. Alcyonarians were present in each of the geographic areas identified in the study (Nova Scotia, Gulf of Maine, Southern New England Shelf, Georges Slope, Southern New England Slope) except Georges Bank. However, *Paragorgia* and *Primnoa* have been reported in the Northeast Peak region of Georges Bank (Theroux and Grosslein 1987). Alcyonarians were most abundant by weight in the Gulf of Maine, and by number on the Southern New England Slope (Theroux and Wigley 1998). In this study, Alcyonarians other than sea pens were collected only from gravel and rocky outcrops. Theroux and Wigley (1998) also found stony corals (*Astrangia danae* and *Flabellum sp*.) in the northeast region, but they were uncommon. In similar work on the mid-Atlantic shelf, the only Alcyonarians encountered were sea pens (Wigley and Theroux 1981). The stony coral *Astrangia danae*, was also found, but its distribution and abundance was not discussed, and is assumed to be minimal.

As opposed to most slope environments, canyons may develop a lush epifauna. Hecker et al. (1983) found faunal differences between the canyons and slope environments. Hecker and Blechschmidt (1979) suggested that faunal differences were due at least in part to increased environmental heterogeneity in the canyons, including greater substrate variability and nutrient enrichment. Hecker et al. (1983) found highly patchy faunal assemblages in the canyons, and also found additional faunal groups located in the canyons, particularly on hard substrates, that do not appear to occur in other slope environments. Canyons are also thought to serve as nursery areas for a number of species (Hecker 2001; Cooper et al. 1987). The canyon habitats in Table 390 were classified by Cooper et al. (1987).

Most finfish identified as slope inhabitants on a broad spatial scale (Gabriel 1992, Overholtz and Tyler 1985, and Colvocoresses and Musik 1983) (Table 383) are associated with canyon features as well (Cooper et al. 1987). Finfish identified by broad studies that were not included in Cooper et al. (1987) include offshore hake, fawn cusk-eel, longfin hake, witch flounder and armored searobin. Canyon species (Cooper et al. 1987) that were not discussed in the broad scale studies include squirrel hake, conger eel and tilefish. Cusk and ocean pout were identified by Cooper et al. (1987) as canyon species, but classified in other habitats by the broad scale studies.

Habitat Type	Geologic Description	Canyon Locations	Most Commonly Observed Fauna
I	Sand or semi-consolidated silt substrate (claylike consistency) with less than 5% overlay of gravel. Relatively featureless except for conical sediment mounds.	Walls & axis	Cerianthid, pandalid shrimp, white colonial anemone, Jonah crab, starfishes, portunid crab, greeneye, brittle stars, mosaic worm, red hake, four spot flounder, shell-less hermit crab, silver hake, gulf stream flounder
II	Sand or semi-consolidated silt substrate (claylike consistency) with more than 5% overlay of gravel. Relatively featureless.	Walls	Cerianthid, galatheid crab, squirrel hake, white colonial anemone, Jonah crab, silver hake, starfishes, ocean pout, brittle stars, shell-less hermit crab, greeneye
III	Sand or semi-consolidated silt (claylike consistency) overlain by siltstone outcrops and talus up to boulder size. Featured bottom with erosion by animals and scouring.	Walls	White colonial anemone, pandalid shrimp, cleaner shrimp, rock anemone, white hake, starfishes, ocean pout, conger eel, brittle star, Jonah crab, lobster, black-bellied rose fish, galatheid crab, mosaic worm, tilefish
IV	Consolidated silt substrate, heavily burrowed/excavated. Slope generally more than 5º and less than 50º Termed "pueblo village" habitat.	Walls	Starfishes, black-bellied rosefish, Jonah crab, lobster, white hake, cusk, ocean pout, cleaner shrimp, conger eel, tilefish, galatheid crab, shell-less hermit crab
V	Sand dune substrate.	Axis	Starfishes, white hake, Jonah crab, and monkfish

Table 390 - Habitat Types for the Canyons of Georges Bank Described by Geologic Attributes and Characteristic Fauna (from Cooper *et al.* 1987).
Faunal characterization is for depths < 230 m only

9.2.4.2 Assemblages of Northeast Shelf Finfish Species Based on Feeding Habits

A guild is defined by Root (1967) as 'a group of species that exploit the same class of environmental resources in a similar way' and explicitly focuses on classifying species based upon their functional role in a community without regard to taxonomy. The guild is used to simplify the structure and dynamics of complex ecosystems regardless of the mechanism generating resource partitioning. Guild members play similar functional roles within ecosystems (Garrison and Link 2000).

Cluster analysis modified from Garrison and Link (2000) found 14 groups of finfish in the Northeast region with significant dietary similarities. These 14 guilds were broadly categorized into six trophic groups, emphasizing similarities in diet at very broad taxonomic levels. Within these groups, the trophic guilds reflect utilization of specific prey types. For example, Guild 6b (Figure 239) consumed primarily engraulids in contrast to other guilds in the piscivore group.

The dietary guilds in the Northeast US shelf fish community reflect similarity in the utilization of specific prey categories. Within guilds, 10 to 15 prey taxa generally accounted for greater than 70% of predator diets and usually less than five prey accounted for greater than 50% of the diet. A relatively small set of prey taxa distinguishes the observed dietary guild structure (2000).

The general guild structure and levels of dietary overlap in this system are consistent across both temporal and spatial scales. Complimentary analyses to the current study within the Georges Bank region identified similar trophic guilds, similar patterns of size-based shifts in diets, and general stability in the trophic guild structure over the last three decades (Garrison 2000). Despite the notable changes in species composition in the Northeast shelf fish community, the patterns of trophic resource use and guild structure are remarkably consistent (2000).

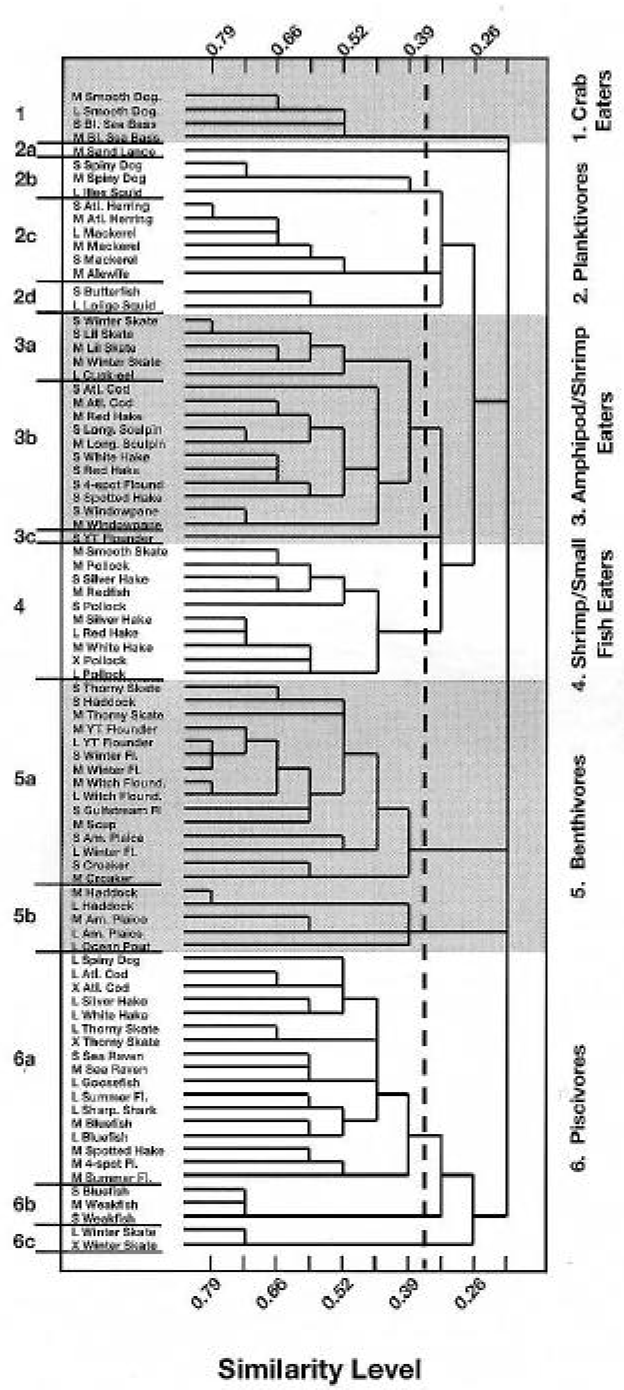


Figure 239 - Dietary guild structure of Northeast finfish species

9.3 Habitat Considerations

9.3.1 Essential Fish Habitat Gear Effect Evaluation and Adverse Impacts Determination

9.3.1.1 Structure of the EFH Adverse Impacts Determination

Section 9.3.1.2 describes commercial fishing gears used in the Northeast region of the U.S. and the geographic distribution and use of the principal bottom-tending gears in three broadly-defined habitat types. It also evaluates the effects of bottom trawls and dredges on benthic marine habitats in the region. Most of this information is derived from the NMFS, NEFMC and MAFMC-sponsored Gear Effects Workshop that evaluated the effects of fishing gears used in the Northeast region on mud, sand, and gravel habitats (NREFHSC 2002) and from an extensive review of relevant gear effects studies (Stevenson et al. 2003). Additional sources of information include work done by the NEFMC Habitat Technical Team and NEFMC and NMFS staff, and a National Research Council report on the Effects of Trawling and Dredging on Seafloor Habitat (NRC 2002). The information in this section serves as the basis for evaluating which gear types, if any, are most likely to have an adverse impact on essential fish habitat for federally-managed species in the NE region.

Section 9.3.1.3 evaluates the vulnerability of all 37 federally-managed species' to gear types found to have potential adverse impacts on EFH. Vulnerability was evaluated according to four broad categories: none (0); low (L); moderate (M); and high (H), based upon a matrix analysis of habitat function, habitat sensitivity and gear use. Results are summarized by species and life stage.

Section 9.3.1.8 summarizes the results and findings of this section, identifying the potential adverse impacts of the three principal mobile, bottom-tending gears on three principal bottom types in the region. These results serve as the basis for analyzing proposed alternatives to minimize the adverse impacts of these gears on EFH.

Sections 9.3.1.9 and 9.3.1.10 addresses non M-S Act fishing activities, and non-fishing related activities, that may adversely affect essential fish habitat.

9.3.1.2 Gear Effects Evaluation

9.3.1.2.1 Overview

Pursuant to the EFH regulations (50 CFR 610.815(a)(2)), FMPs must include an evaluation of the potential adverse effects of fishing on EFH, including effects of each fishing activity regulated under federal FMPs. The evaluation should consider the effects of each fishing activity on each type of habitat found within EFH. FMPs must describe each fishing activity, review and discuss all available and relevant information (such as information regarding the intensity, extent, and frequency of any adverse effect on EFH; the type of habitat within EFH that may be affected adversely; and the habitat functions that may be disturbed), and provide conclusions as to whether and how each fishing activity adversely affects EFH. The evaluation should also consider the cumulative effects of multiple fishing activities on EFH. In completing this evaluation, Councils should use the best scientific information available, as well as other appropriate information sources. Councils should consider different types of information according to their scientific rigor.

Magnuson-Stevens Act / EFH Provisions detailed in the Final Rule mandates that each FMP must: Contain an evaluation of the potential adverse effects of fishing on EFH designated under the FMP, including effects of each fishing activity regulated under the FMP or other Federal FMPs.

Consider the effects of each fishing activity on each type of habitat found within EFH.
Describe each fishing activity, review and discuss all available relevant information, and provide conclusions regarding whether and how each fishing activity adversely affects EFH.

This section, considered the Gear Effects Evaluation for the Draft Environmental Impact Statement for the Essential Fish Habitat Components of Amendment 13, satisfies these requirements. The SFA requires the NEFMC to minimize, to the extent practicable, the adverse impacts of fishing on the EFH associated with any federally regulated fishing activities in the Northeast region. To do this, this amendment must evaluate the effects of all fishing gears used in the region on groundfish EFH, following the guidelines indicated above. NEPA requires that each management alternative, either for improving yield or minimizing effects of fishing on groundfish EFH, must be analyzed to evaluate the environmental consequences on other fishery resources and their habitats and benthic communities.

Since the implementation of the Council's Omnibus EFH Amendment of 1998 (NEFMC 1998), NMFS, NEFMC and MAFMC conducted a Gear Effects Workshop that evaluated the effects of fishing gears used in the Northeast region on mud, sand, and gravel habitats (NEREFHSC 2002). Additional sources of information include work done by the NEFMC Habitat Technical Team, and a National Research Council report on the Effects of Trawling and Dredging on Seafloor Habitat (NRC 2002). Additional information is included in this document.

9.3.1.2.2 Gear Descriptions

Updated gear descriptions are included for the following general gear categories: bottom tending mobile gear, bottom tending static gear, pelagic gear, and other gears. The Northeast region falls within the jurisdiction of the NEFMC and MAFMC as well as the individual states from Maine to North Carolina which are represented by the Atlantic States Marine Fisheries Commission (ASMFC). These jurisdictions are responsible for the management of many different fisheries extending from the upper reaches of the rivers and estuaries out to 200 miles offshore at the limit of the Exclusive Economic Zone (EEZ).

Sixty categories of fishing gear were identified as having been associated with landings of federal or state managed species based on a review of the National Marine Fisheries Service commercial fisheries landings data for 1999 and an ASMFC report on gear impacts to submerged aquatic vegetation (Stephan et al. 2000). Fishing gears considered in this report are those used to land any amount of any species managed by either the NEFMC or MAFMC (Table 391) as well as gears that contributed 1% or more of any individual state's total landings for all species (Table 392). Although certain gear types are not managed under the auspices of the MSA, this methodology recognizes that certain gear utilized in state waters may have adverse impacts to EFH that is designated in nearshore, estuarine and riverine areas. Table 393 provides the list of all 60 gears considered and indicates whether the gear is utilized in estuaries, coastal waters (0-3 miles), or offshore waters (3-200 miles). Since the seabed is the location of the habitat types most susceptible to gear disturbances, Table 393 also indicates whether the gear contacts the bottom and if the use of the gear is regulated under a federal FMP. This report considers gear to be regulated under a federal FMP if it is typically utilized to harvest fish under a federal vessel or operators permit. Table 394 indicates gear used in state-managed fisheries that contact the bottom.

GEAR	Dogfish	Bluefish	Butterfish	Surfclam	Ocean Quahog	Cod, Atlantic	Red Crab	Summer Flounder	Windowpane Flounder	Winter Flounder	Witch Flounder	Yellowtail Flounder	Monkfish	Haddock	Hake, Red	Hake, Silver	Hake, White	Halibut, Atlantic	Herring, Atlantic	Mackerel, Atlantic	Plaice, American	Pollock	Ocean Pout	Redfish	Sea Scallop	Scup	Black Sea Bass	Skates	Squid, Loligo	Squid, Illex	Tilefish
Bag Nets			-																											-	
Beam Trawls, Other		-	-		-					-	-	-	-		-	-									-	-			-		
Cast Nets		-						-																		-					
Combined Gears		-																									-				-
Diving Outfits, Other																									-	-					
Dredge Clam				92	100			-		-			-												-	-					
Dredge Conch								-																				-			
Dredge Scallop, Bay										-	-		-												-						
Dredge Scallop, Sea		-	-			-		2	-	-	-	1	16			-	-				-	-			90	-	-	-	-	-	-
Floating Traps (Shallow)		1	-			-		-		-			-			-			-	2		-				9	-	-	-		
Fyke And Hoop Nets, Fish		-	-					-	-	-	-	-	-															-			
Gill Nets, Drift, Other	-	9	-					-		-		-	-		-	-			-	-			-			-	-	-	-		
Gill Nets, Drift, Runaround		5	-																												
Gill Nets, Other		5	-					-					-							-							-	-			
Gill Nets, Sink/Anchor, Other	60	16	-			20		-	-	4	2	6	29	7	-	-	35	8	-	1	2	55	3	16	-	-	-	12	-	-	-
Gill Nets, Stake	-	-	-					-					-						-	-											
Haul Seines, Beach	-	1	-					-		-					-	-			-	-								-			
Haul Seines, Long		-	-																												
Haul Seines, Long(Danish)						-				-	-	-	-	-		-	-				-	-		-				-			
Lines Hand, Other	-	5	-			5		2	-	-	-	-	-	-	-	-	-		-	-	-	-	4	-		12	14	-	-		2
Lines Long Set With Hooks	-	-	-			17		-		-	-	-	-	2	-	-	5	-		-	-	2	7	-	-	-	-	-	-		61
Lines Long, Reef Fish																															32
Lines Troll, Other		-	-					-																			-				-
Lines Troll With Baits								-																							
Otter Trawl Bottom, Fish	38	20	93			57		92	98	95	97	92	53	91	98	99	58	89	2	93	97	42	77	83	-	66	25	86	99	100	4
Otter Trawl Bottom, Scallop		-				-		-		-	-	-	-	-							-	-			9		-	-	-		
Otter Trawl Midwater																			53	-											

Table 391 - Percentage of Landings for Federally Managed Species by Fishing Gear Type Used in Northeast Region in 1999

"-" Indicates there was less than 1% landings associated with this gear type for this species
"Blank" Indicates there were no landings recorded for this gear type for this species

GEAR	Dogfish	Bluefish	Butterfish	Surfclam	Ocean Quahog	Cod, Atlantic	Red Crab	Summer Flounder	Windowpane Flounder	Winter Flounder	Witch Flounder	Yellowtail Flounder	Monkfish	Haddock	Hake, Red	Hake, Silver	Hake, White	Halibut, Atlantic	Herring, Atlantic	Mackerel, Atlantic	Plaice, American	Pollock	Ocean Pout	Redfish	Sea Scallop	Scup	Black Sea Bass	Skates	Squid, Loligo	Squid, Illex	Tilefish
Pots And Traps, Conch		-	-			-																	-				-				
Pots And Traps, Crab, Blue		-	-					-																			-				
Pots and Traps, Crab, Blue Peeler		-																													
Pots And Traps, Crab, Other		-					60	-																							
Pots And Traps, Fish		-	-			-		-		-			-		-	-	-		-	-		-	7	-		5	53	-	-		-
Pots And Traps, Lobster Inshore		-	-			-		-		-			-	-	-	-	-			-		-	-	-	-	-	-	-	-		
Pots And Traps, Lobster Ofshore		-	-			-	40	-		-			-		-		-						-	-		-	-		-		-
Pots And Traps, Other		-						-																		-	3				
Pound Nets, Crab		-						-																							
Pound Nets, Fish		5	3			-		2	-	-		-	-		-	-			-	-						-	-	-	-		
Pound Nets, Other		-	-					-		-										2						2	-		-		
Purse Seines, Herring																			31												
Purse Seines, Other		3																													
Reel, Electric or Hydraulic																											-				
Rod and Reel																											-				
Scottish Seine		-	-			-		-	-	-	-	-	-	-	-	-	-			-	-	-	-			-	-	-	-		
Scrapes								-																							
Spears		-																									-				
Stop Seines																			-												
Trawl Midwater, Paired																			14												
Weirs																			-												

Table 391 - Percentage of Landings for Federally Managed Species by Fishing Gear Type Used in Northeast Region in 1999*(cont.)*

	Percent of Landings (1% or more) for All Species by State											
Gear	CT	DE	MA	MD	ME	NC	NH	NJ	NY	RI	VA	% Landings All States Combined
By Hand, Other		18										
Diving Outfits, Other					5							1
Dredge Clam			9	10				39	1	1		6
Dredge Crab		11									1	
Dredge Mussel					1							
Dredge Other					3							
Dredge Scallop, Sea	7		10		1		1	2			1	2
Dredge Urchin, Sea					1							
Floating Traps (Shallow)										1		
Fyke And Hoop Nets, Fish				2								
Gill Nets, Drift, Other		4		3				2				1
Gill Nets, Drift, Runaround						1						
Gill Nets, Other						14						1
Gill Nets, Sink/Anchor,			12	5	1		42	5	5	4	3	4
Gill Nets, Stake		7										
Haul Seines, Beach				2							1	
Haul Seines, Long						1						
Hoes					1							
Lines Hand, Other		1	2	1		1	1		1			1
Lines Long Set With Hooks			4			1		1	4			1
Lines Long, Shark						1						
Lines Troll, Other						1						
Lines Trot With Baits				17								1
Not Coded	16				1			1	30			2
Otter Trawl Bottom, Shrimp					1	6	3					1
Otter Trawl Midwater			11		21		8			18		6
Pots And Traps, Conch		2										
Pots And Traps, Crab, Blue		51		36		36		3			6	8
Pots And Traps, Crab, Other			2							1		
Pots And Traps, Eel		2		1								
Pots And Traps, Fish		1		3								
Pots And Traps, Lobster Inshore	13		5		25		9			4		5
Pots And Traps, Lobster Offshore	2		4				9	1		2		1
Pots And Traps, Other			1		1							
Pound Nets, Crab				1								
Otter Trawl Bottom, Crab						1						
Otter Trawl Bottom, Fish	61		38	3	9	7	26	26	58	56	2	18
Pound Nets, Fish				14		1			1		4	2
Purse Seines, Herring			1		23							4
Purse Seines, Menhaden						27		18			74	28
Purse Seines, Other											7	2

Table 392 - Principal Fishing Gears Used in Each State in the Northeast Region in 1999

GEAR	Estuary or Bay	Coastal 0-3 Miles	Offshore 3-200 Miles	Contacts Bottom	Federally Regulated
Bag Nets	X	X	X		X
Beam Trawls	X	X	X	X	X
By Hand	X	X			X
Cast Nets	X	X	X		
Clam Kicking	X			X	
Diving Outfits	X	X	X		
Dredge Clam	X	X	X	X	X
Dredge Conch	X			X	
Dredge Crab	X	X		X	
Dredge Mussel	X	X		X	
Dredge Oyster, Common	X			X	
Dredge Scallop, Bay	X			X	
Dredge Scallop, Sea		X	X	X	X
Dredge Urchin, Sea		X	X	X	
Floating Traps (Shallow)	X	X		X	X
Fyke And Hoop Nets, Fish	X	X		X	
Gill Nets, Drift, Other			X		X
Gill Nets, Drift, Runaround			X		X
Gill Nets, Sink/Anchor, Other	X	X	X	X	X
Gill Nets, Stake	X	X	X	X	X
Haul Seines, Beach	X	X		X	
Haul Seines, Long	X	X		X	
Haul Seines, Long(Danish)		X	X	X	X
Hoes	X			X	
Lines Hand, Other	X	X	X		X
Lines Long Set With Hooks		X	X	X	X
Lines Long, Reef Fish		X	X	X	X
Lines Long, Shark		X	X		X
Lines Troll, Other		X	X		X
Lines Trot With Baits		X	X		X
Otter Trawl Bottom, Crab	X	X	X	X	
Otter Trawl Bottom, Fish	X	X	X	X	X
Otter Trawl Bottom, Scallop		X	X	X	X
Otter Trawl Bottom, Shrimp	X	X	X	X	X
Otter Trawl Midwater		X	X		X
Pots And Traps, Conch	X	X		X	
Pots and Traps, Crab, Blue Peeler	X	X		X	
Pots And Traps, Crab, Blue	X	X		X	
Pots And Traps, Crab, Other	X	X	X	X	X
Pots And Traps, Eel	X	X		X	
Pots and Traps, Lobster Inshore	X	X		X	

Table 393 - Fishing Gears Used in Estuaries and Bays, Coastal Waters, and Offshore Waters of the EEZ, from Maine to North Carolina

GEAR	Estuary or Bay	Coastal 0-3 Miles	Offshore 3-200 Miles	Contacts Bottom	Federally Regulated
Pots and Traps, Lobster Offshore			X	X	X
Pots and Traps, Fish	X	X	X	X	X
Pound Nets, Crab	X	X		X	
Pound Nets, Fish	X	X		X	
Purse Seines, Herring		X	X		X
Purse Seines, Menhaden		X	X		
Purse Seines, Tuna		X	X		X
Rakes	X			X	
Reel, Electric or Hydraulic		X	X		X
Rod and Reel	X	X	X		X
Scottish Seine		X	X	X	X
Scrapes	X			X	
Spears	X	X	X		
Stop Seines	X			X	
Tongs and Grabs, Oyster	X			X	
Tongs Patent, Clam Other	X			X	
Tongs Patent, Oyster	X			X	
Trawl Midwater, Paired		X	X		X
Weirs	X			X	

Table 393 - Fishing Gears Used in Estuaries and Bays, Coastal Waters, and Offshore Waters of the EEZ, from Maine to North Carolina(cont.)

Includes all gears that accounted for 1% or more of any state's total landings and all gears that harvested any amount of any federally managed species, based upon 1999 NMFS landings data and ASMFC Gear Report (ASMFC 2000). Entries in bold type are gears that are federally managed and contact the bottom.

GEAR	Estuary or Bay	Coastal 0-3 Miles	Offshore 3-200 Miles
Clam Kicking	X		
Dredge Conch	X		
Dredge Crab	X	X	
Dredge Mussel	X	X	
Dredge Oyster, Common	X		
Dredge Scallop, Bay	X		
Dredge Urchin, Sea		X	X
Fyke And Hoop Nets, Fish	X	X	
Haul Seines, Beach	X	X	
Haul Seines, Long	X	X	
Otter Trawl Bottom, Crab	X	X	X
Otter Trawl Bottom, Fish	X	X	X
Pots And Traps, Conch	X	X	
Pots and Traps, Crab, Blue Peeler	X	X	
Pots And Traps, Crab, Blue	X	X	
Pots And Traps, Eel	X	X	

Table 394 – State-Managed Fishing Gears Used in Estuaries and Bays, Coastal Waters, and Offshore Waters of the EEZ, from Maine to North Carolina that Contact the Bottom
Includes all gears that accounted for 1% or more of any state's total landings and all gears that harvested any amount of any federally managed species, based upon 1999 NMFS landings data and ASMFC Gear Report (ASMFC 2000).

GEAR	Estuary or Bay	Coastal 0-3 Miles	Offshore 3-200 Miles
Pots and Traps, Lobster Inshore	X	X	
Pound Nets, Crab	X	X	
Pound Nets, Fish	X	X	
Rakes	X		
Scrapes	X		
Stop Seines	X		
Tongs and Grabs, Oyster	X		
Tongs Patent, Clam Other	X		
Tongs Patent, Oyster	X		
Weirs	X		

Table 394 – State-Managed Fishing Gears Used in Estuaries and Bays, Coastal Waters, and Offshore Waters of the EEZ, from Maine to North Carolina that Contact the Bottom *(cont.)*

9.3.1.2.2.1 Bottom Tending Mobile Gear

9.3.1.2.2.1.1 Otter Trawls

Trawls are classified by their function, bag construction, or method of maintaining the mouth opening. Function may be defined by the part of the water column where the trawl operates (e.g., bottom) or by the species that it targets (Hayes 1983). There is a wide range of otter trawl types used in the Northeast as a result of the diversity of fisheries prosecuted and bottom types encountered in the region (NREFHSC 2002). The specific gear design used is often a result of the target species (whether they are found on or off the bottom) as well as the composition of the bottom (smooth versus rough and soft versus hard). There are two three components of the otter trawl that come in contact with the sea bottom: the doors, the ground cables and bridles which attach the doors to the wings of the net, and the sweep (or foot-rope) which runs along the bottom of the net mouth. Bottom trawls are towed at a variety of speeds, but average about 5.5 km/hr (3 knots or nmi/hr).

9.3.1.2.2.1.1.1 Doors

The traditional otter board is a flat, rectangular wood structure with steel fittings and a steel "shoe" along the bottom that prevents the bottom of the door from damage and wear as it drags over the bottom. Other types include the V-type (steel), polyvalent (steel), oval (wood), and slotted spherical otter board (steel) (Sainsbury 1996). It is the spreading action of the doors resulting from the angle at which they are mounted that creates the hydrodynamic forces needed to push them apart. These forces also push them down towards the sea floor. On fine-grained sediments, the doors also function to create a silt cloud that aids in herding fish into the mouth of the net (Carr and Milliken 1998). In shallow waters, light-weight doors are typically used to ensure that the doors and the net spread fully. In these cases, light foam-filled doors can be used (Sainsbury 1996). Vessels fishing large nets in deeper water require very large spreading forces from the doors. In these cases, a 15 m^2 (49 ft^2) V-door weighing 640 kg (1480 lbs) can provide 9 metric tons of spreading force (Sainsbury 1996).

9.3.1.2.2.1.1.2 Ground Cables and Bridles

Steel cables are used to attach the doors to the wings of the net. The ground cables run along the bottom from each door to two cables (the "bridle") that diverge to attach to the top and bottom of the net wing. The bottom portion of the bridle also contacts the bottom. In New England, fixed rubber discs ("cookies") or rollers are attached to the ground cables and lower bridle. In general, bridles vary in length from 9 m to 73 m (30 - 200 ft) while ground cables can be from 0 to 73 m (200 ft) depending upon bottom conditions and towing speed (Sainsbury 1996). The length of these cables can therefore increase the area swept by the trawl by as much as three fold.

9.3.1.2.2.1.1.3 Sweeps

On smooth bottoms, the sweep may be a steel cable weighted with chain, or may be merely rope wrapped with wire. On rougher bottoms, rubber discs (“cookies”) or rollers are attached to the sweep to assist the trawl's passage over the bottom (Sainsbury 1996). There are two main types of sweep used in smooth bottom in New England (Mirarchi 1998). In the traditional chain sweep, loops of chain are suspended from a steel cable, with only 2-3 links of the chain touching bottom. Contact of the chain with the bottom reduces the buoyancy of the trawl – which would otherwise be negatively buoyant – to the point where it skims along just a few inches above the bottom to catch species like squid and scup that swim slightly above the bottom. The other type of sweep is heavier and is used on smooth bottom to catch flounder. Instead of a cable, rubber cookies stamped from automobile tires are attached to a heavy chain. This type of sweep is always in contact with the bottom. Cookies vary in diameter from 1.5 to 6.5 cm (4 to 16 inches) and do not rotate (Carr and Milliken 1998).

Roller sweeps and rockhoppers are used on irregular bottom (Carr and Milliken 1998). Vertical rubber rollers rotate freely and are as large as 14.5 cm (36 inches) in diameter. In New England, the rollers have been largely replaced with "rockhopper" gear that uses larger fixed rollers and are designed to “hop” over rocks as large as 1 meter in diameter. Small rubber “spacer” discs are placed in between the larger rubber discs in both types of sweep. Rockhopper gear is no longer used exclusively on hard bottom habitats, but is actually quite versatile and used in a variety of habitat types (NREFHSC 2002). “Street-sweepers” were first used in Massachusetts in 1995, replacing heavier rockhopper gear, and consist of circular brushes up to 12.5 cm (31 inches) in diameter. They are lighter than rubber rockhopper gear and can probably fish much rougher bottom than other sweep designs (Carr and Milliken 1998).

Flatfish are primarily targeted with a mid-range mesh flat net that has more ground rigging and is designed to get the fish up off the bottom. A high rise or fly net with larger mesh is used to catch demersal fish that rise higher off the bottom than flatfish (NREFHSC 2002). Crabs, scallops, and lobsters are also harvested in large mesh bottom trawls.

Small mesh bottom trawls are used to capture northern and southern shrimp, whiting, butterfish and squid and usually employ a light chain sweep. Small-mesh trawls are designed, rigged, and used differently than large-mesh fish trawls. Bottom trawls used to catch northern shrimp in the Gulf of Maine, for example, are smaller than most fish trawls and are towed at slower speeds (<2 knots versus 4 knots or so for a fish trawl). Footropes range in length from 12 m to over 30 m (40 - 100 ft), but most are 15 to 27 m (50 - 90 ft). Because shrimp inhabit flatter bottom than many fish do, roller gear tend to be smaller in diameter on shrimp nets because they are not towed over rough bottom (Dan Schick, Maine Dept. of Marine Resources, personal communication). Because shrimp can not be herded in the same manner as fish, footropes on shrimp trawls are bare (no cookies) and are limited to 27 m (90 ft) in length (D. Schick, personal communication). Northern shrimp trawls are also equipped with Nordmore grates in the funnel of the net to reduce the by-catch of groundfish. Southern shrimp trawlers that catch brown and white shrimp typically tow 2-4 small trawls from large booms extended from each side of the vessel (DeAlteris 1998). Northern shrimp trawlers tow a single net astern.

The raised-footrope trawl was designed especially for fishing for whiting, red hake, and dogfish. It was designed to provide vessels with a means of continuing to fish for small mesh species without catching groundfish. In this type of trawl, 1 m (42 inches) long chains connect the sweep to the footrope, which results in the trawl fishing about 0.45 to 0.6 m (1.5-2 ft) above the bottom (Carr and Milliken 1998). The raised footrope and net allows complete flatfish escapement, and theoretically travels over codfish and other roundfish (whiting and red hake tend to swim slightly above the other groundfish). Although the doors of the trawl still ride on the bottom, Carr and Milliken (1998) report that studies have confirmed that the raised footrope sweep has much less contact with the sea floor than does the traditional cookie sweep that it replaces.

An important consideration in understanding the relative effects of different otter trawl configurations is their weight in water relative to their weight in air. Rockhopper gear is not the heaviest type of ground gear used in this region since it loses 80% of its weight in water (i.e., a rockhopper sweep that weighs 1000 pounds on land may only weigh 200 pounds in water) (NREFHSC 2002). Streetsweeper gear is much heavier in the water due to the use of steel cores in the brush components. Plastic-based gear has the smallest weight in water to weight in air ratio (approximately 5%) (NREFHSC 2002). For the same reasons, steel doors are much heavier in water than wooden doors (Mirarchi 1998).

9.3.1.2.2.1.2 Beam Trawls

The beam trawl is much like an otter trawl except the net is spread horizontally by a steel beam that runs the horizontal width of the net rather than with otter boards. The net is spread vertically by heavy steel trawl heads that generally have skid-type devices with a heavy shoe attached (Sainsbury 1996). Beam trawls currently in use in Europe are up to 12 m (40 ft) in width and very heavy, increasing in weight from 3.5 mt (7,700 lbs) in the 1960s to as much as 10 mt (22,000 lbs) in the 1980s (Rogers et al. 1998). Despite the weight of the gear, increased towing power and size of trawlers have allowed towing speeds to reach 14.8 km/hr (8 knots or nmi/hr).

It is believed that beam trawls are not currently used in the Northeast U.S. (NREFHSC 2002). A few beam trawls were used in the 1970s to catch monkfish, but the fishery was unsuccessful. In the mid 1990s, a number of boats off New Bedford, MA used what were referred to as beam trawls, but the gear more closely resembled a scallop dredge rather than the traditional, European beam trawls. There are a few boats that are currently recorded as using beam trawls in the NMFS fishery landings database, but it is believed these were most likely mis-characterized and are actually otter trawls being deployed from the side of the vessels (NREFHSC 2002).

It is unlikely that fishermen would begin using beam trawls in the Northeast U.S. Beam trawls are prevalent in the North Sea where the water is dark and murky and the fisheries target flatfishes, which sit slightly under the sediments. In these fisheries, the beam trawl acts to sieve the fish up off the seafloor. The lack of conventional herding effect and small mouth opening of the beam trawl would not be effective for harvesting U.S. target species. Furthermore, most vessels being used in the Northeastern U.S. do not have the size or power required to handle a beam trawl (NREFHSC 2002). Therefore, beam trawls will not be considered further in this report as a gear type potentially impacting marine habitats off the Northeastern U.S.

9.3.1.2.2.1.3 Hydraulic Clam Dredges

Hydraulic clam dredges have been used in the surfclam (*Spisula solidissima*) fishery for over five decades and in the ocean quahog (*Arctica islandica*) fishery since its inception in the early 1970s. These dredges are highly sophisticated and are designed to: 1) be extremely efficient (80 to 95% capture rate); 2) produce a very low bycatch of other species; and 3) retain very few undersized clams (NREFHSC 2002).

The typical dredge is 3.7 m (12 feet) wide and about 6.7 m (22 feet) long and uses pressurized water jets to wash clams out of the seafloor. Towing speed at the start of the tow is about 4.5 km/hr (2.5 knots or nmi/hr) and declines as the dredge accumulates clams. The dredge is retrieved once the vessel speed drops below about 3 km/hr (1.5 knots), which can be only a few minutes in very dense beds. However, a typical tow lasts about 15 minutes. The water jets penetrate the sediment in front of the dredge to a depth of about 20 - 25 cm (8 - 10 inches), depending on the type of sediment and the water pressure. The water pressure that is required to fluidize the sediment varies from 50 pounds per square inch (psi) in coarse sand to 110 psi in finer sediments. The objective is to use as little water as possible since too much pressure will blow sediment into the clams and reduce product quality. The “knife” (or “cutting bar”) on the leading bottom edge of the dredge opening is 14 cm (5.5 inches) deep for surfclams and 8.9 cm (3.5

inches) for ocean quahogs. The knife "picks up" clams that have been separated from the sediment and guides them into the body of the dredge ("the cage"). If the knife size is not appropriate, clams can be cut and broken, resulting in significant mortality of clams left on the bottom. The downward pressure created by the runners on the dredge is about 1 psi (NREFHSC 2002). The high water pressure associated with the hydraulic dredge can cause damage to the flora and fauna associated with bottom habitats.

Before 1990, two types of hydraulic dredges were common in the fishery, stern rig dredges and side rig dredges. A side rig dredge has a chain bag that drags behind the dredge and smooths out the trench created by the dredge. The chain bag results in significantly more damage to small clams and other bycatch than occurs with the stern rig dredge. Currently, most of the dredges in the fishery are stern rig dredges, which are basically giant sieves. Small clams and bycatch fall through the bottom of the cage into the trench and damage or injury to benthic organisms is minimal. Improvements in gear efficiency have reduced bottom time and helped to confine the harvest of surfclams to a relatively small area in the mid-Atlantic Bight (NREFHSC 2002).

Hydraulic clam dredges can be operated in areas of large grain sand, fine sand, sand and small grain gravel, sand and small amounts of mud, and sand and very small amounts of clay. Most tows are made in large grain sand. Dredges are not fished in clay, mud, pebbles, rocks, coral, large gravel greater than one half inch, or seagrass beds (NREFHSC 2002).

In the soft-clam (*Mya arenaria*) fishery, the dredge manifold and blade are located just forward of an escalator, or conveyor belt, that carries the clams to the deck of the vessel. These vessels are restricted to water depths less than one-half the length of the escalator and are typically operated from 15 m (49ft) vessels in water depths of 2-6 m (6.6 - 20 ft) (DeAlteris, 1998). The escalator dredge is not managed under federal fishery management plans. A variation of this type of dredge, the suction dredge, is used in Europe to harvest several bivalve species. Sediment and clams that are dislodged by water pressure are sucked through a hose to the vessel. These dredges are also restricted to shallow water.

9.3.1.2.2.1.4 Sea Scallop Dredges

The New Bedford scallop dredge is the primary gear used in the Georges Bank and mid-Atlantic sea scallop (*Placopecten magellanicus*) fishery and is very different than dredges utilized in Europe and the Pacific because it is a toothless dredge.

The forward edge of the New Bedford dredge includes the cutting bar, which rides above the surface of the substrate, creating turbulence that stirs up the substrate and kicks objects (including scallops) up from the surface of the substrate into the bag. Shoes on the cutting bar are in contact with and ride along the substrate surface (NREFHSC 2002). A sweep chain is attached to each shoe and attaches to the bottom of the ring bag (Smolowitz 1998). The bag is made up of metal rings with chafing gear on the bottom and twine mesh on the top, and drags on the substrate when fished. Tickler chains run from side to side between the frame and the ring bag and, in hard bottom scalloping, a series of rock chains run from front to back to prevent large rocks from getting into the bag (Smolowitz 1998). New Bedford dredges are typically 4.3 m (14 feet) wide; two of them are towed by a single vessel at speeds of 4 to 5 knots. New Bedford dredges used along the Maine coast are smaller. Towing times are highly variable, depending on how many marketable sized scallops are on the bottom and the location.

In the Northeast region, scallop dredges are used in high and low energy sand environments, and high energy gravel environments. Although gravel exists in low energy environments of deepwater banks and ridges in the Gulf of Maine, the fishery is not prosecuted there (NREFHSC 2002).

The leading edge of scallop dredges used in Europe, Australia, and New Zealand to catch other species of scallop that "dig" into the bottom have teeth which dig into the substrate. This type of dredge is used by smaller vessels that are not able to tow a non-toothed dredge fast enough (4-5 knots) to fish effectively (NREFHSC 2002). Some of the European scallop dredges are spring-loaded so that the cutting bar flexes backward when it contacts a hard object on the bottom, then springs back when the dredge passes over the obstacle. These dredges are approximately 0.75 m (2.5 ft) wide and may be fished in gangs of 3-9 dredges on either side of the vessel (Kaiser et al. 1996a). A typical tooth bar bears 9 teeth, 11 cm (4.3 inches) long, spaced about 8 cm (3 inches) apart. French dredges, 2 m (6.6 ft) wide, are not spring-loaded and generally are fished on cleaner ground. They are fitted with a diving vane to improve penetration of the bottom. Scallop dredges used in Australia and New Zealand are heavy, rigid, wire mesh "boxes" that do not have a chain bag (McLoughlin et al. 1991). A very limited amount of scallop dredging with toothed dredges (e.g., the "Digby" dredge) takes place along the U.S. and Canadian coast of the Gulf of Maine.

9.3.1.2.2.1.5 Other Non-Hydraulic Dredges

9.3.1.2.2.1.5.1 Quahog Dredge

Mahogany quahogs (same species, *Arctica islandica*, as harvested in the mid-Atlantic) are harvested in eastern Maine coastal waters using a dredge that is essentially a large metal cage on skis with 15 cm (6 inch) long teeth projecting at an angle off the leading bottom edge (Pete Thayer, Maine Dept. of Marine Resources, personal communication). Maine state regulations limit the length of the cutter bar to 91 cm (36 inches). The teeth rake the bottom and lift the quahogs into the cage. This fishery takes place in small areas of sand and sandy mud found among bedrock outcroppings in depths of 9 to > 76 m (30 - 250 ft) in state and federal coastal waters north of 43ºE 20'N latitude. These dredges are used on smaller boats, about 9 - 12 m long (30 to 40 ft) and are pulled through the seabed using the boat's engine (NREFHSC 2002). This dredging activity is managed under a federal fishery management plan.

9.3.1.2.2.1.5.2 Oyster or Crab Dredge/Scrape/Mussel Dredge

The oyster dredge is a toothed dredge consisting of a steel frame 0.5-2.0 m (1.6 -6.6 ft.) in width, a tow chain or wire attached to the frame, and a bag to collect the catch. The bag is constructed of rings and chain-links on the bottom to reduce the abrasive effects of the seabed, and twine or webbing on top. The dredge is towed slowly (<1 m/sec) in circles, from vessels 7 to 30 m (23 - 98 ft.) in length (DeAlteris 1998). Crabs are harvested with dredges similar to oyster dredges. Stern-rig dredge boats (approximately 15 m (49') in length) tow two dredges in tandem from a single chain warp. The dredges are equipped with 10 cm (4 inch) long teeth that rake the crabs out of the bottom. (DeAlteris 1998). The toothed dredge is also used for harvesting mussels (Hayes 1983). These dredging activities are not managed under federal fishery management plans.

9.3.1.2.2.1.5.3 Bay Scallop Dredge

Bay scallops usually reside on the bottom. The bay scallop dredge may be 1 to 1.5 m (3.3 - 4.9 ft.) wide and about twice as long. The simplest bay scallop dredge can be just a mesh bag attached to a metal frame that is pulled along the bottom. For bay scallops that are located on sand and pebble bottom, a small set of raking teeth are set on a steel frame, and skids are used to align the teeth and the bag (Sainsbury 1996). This dredging activity is not managed under federal fishery management plans.

9.3.1.2.2.1.5.4 Sea Urchin Dredge

Similar to a simple bay scallop dredge, the sea urchin dredge is designed to avoid damaging the catch. It has an up-turned sled-like shape at the front that includes several leaf springs tied together with a steel bar. A tow bail is welded to one of the springs and a chain mat is rigged behind the mouth box frame. The frame is fitted with skids or wheels. The springs act as runners, enabling the sled to move over rocks without hanging up. The chain mat scrapes up the urchins. The bag is fitted with a codend for ease of emptying. This gear is generally only used in waters up to 100 m (330 ft.) deep (Sainsbury 1996). This dredging activity is not managed under federal fishery management plans.

9.3.1.2.2.1.5.5 Clam "Kicking"

Clam kicking is a mechanical form of hard clam harvest practiced in North Carolina which involves the modification of boat engines so that the propeller is directed downwards instead of backwards (Guthrie and Lewis 1982). In shallow water the propeller wash is powerful enough to suspend bottom sediments and clams into a plume in the water column, which allows them to be collected in a trawl net towed behind the boat (Stephan et al. 2000). This activity is not managed under federal fishery management plans.

9.3.1.2.2.2 Seines

9.3.1.2.2.2.1 Haul Seines

Haul seining is a general term describing operations where a net is set out between the surface and sea bed to encircle fish. It may be undertaken from the shore (beach seining), or away from shore in the shallows of rivers, estuaries or lakes (Sainsbury 1996). Seines typically contact the sea bottom along the lead line. Additionally the net itself may scrape along the bottom as it is dragged to shore or the recovery vessel. This activity is not managed under federal fishery management plans.

9.3.1.2.2.2.1.1 Beach Haul Seines

The beach seine resembles a wall of netting of sufficient depth to fish from the sea surface to the sea bed, with mesh small enough that the fish do not become gilled. A floatline runs along the top to provide floatation and a leadline with a large number of weights attached ensures that the net maintains good contact with the bottom. Tow lines are fitted to both ends. The use of a beach seine generally starts with the net on the beach. One end is pulled away from the beach, usually with a small skiff or dory, and is taken out and around and finally back in to shore. Each end of the net is then pulled in towards the beach, concentrating the fish in the middle of the net. This is eventually brought onshore as well and the fish removed. This gear is generally used in relatively shallow inshore areas. (Sainsbury 1996). This activity is not managed under federal fishery management plans.

9.3.1.2.2.2.1.2 Long Haul Seines

The long haul seine is set and hauled in shallow estuarine and coastal areas from a boat typically 15 m (49 ft.) long. The net is a single wall of small mesh webbing less than 5 cm (2 inches), and is usually greater than 400 m (1440 ft.) in length and about 3 m (9.8 ft.) in depth. The end of the net is attached to a pole driven into the bottom, and the net is set in a circle so as to surround fish feeding on the tidal flat. After closing the circle, the net is hauled into the boat, reducing the size of the circle, and concentrating the fish. Finally, the live fish are brailed or dip-netted out of the net. (DeAlteris 1998). This activity is not managed under federal fishery management plans.

9.3.1.2.2.2.2 Stop Seines

These are seines that are used in coastal embayments to close off the opening to a small cove or bight. This method is used in Maine to harvest schools of juvenile herring (Everhart and Youngs 1981). This activity is not managed under federal fishery management plans.

9.3.1.2.2.2.3 Danish and Scottish Seines

Danish or Long seining (anchor dragging) was developed in the 1850s prior to the advent of otter trawling. The Danish seine is a bag net with long wings, that includes long warps set out on the seabed enclosing a defined area. As the warps are retrieved, the enclosed area (a triangle) reduces in size. The warps dragging along the bottom herd the fish into a smaller area, and eventually into the net mouth. The gear is deployed by setting out one warp, the net, then the other warp. On retrieval of the gear, the vessel is anchored. This technique of fishing is aimed at specific schools of fish located on smooth bottom. In contrast to Danish seining, if the vessel tows ahead while retrieving the gear, then this is referred to as

Scottish seining or fly-dragging. This method of fishing is considered more appropriate for working small areas of smooth bottom, surrounded by rough bottom. Scottish and Danish seines have been used experimentally in U.S. demersal fisheries. Space conflicts with other mobile and fixed gears, have precluded the further development of this gear in the U.S., as compared to Northern Europe (DeAlteris 1998). This activity is managed under federal fishery management plans.

9.3.1.2.2.3 Bottom-Tending Static Gear

9.3.1.2.2.3.1 Pots

Pots are portable, rigid devices that fish and shellfish enter through small openings, with or without enticement by bait (Everhart and Youngs 1981; Hubert 1983). They are used to capture lobsters, crabs, black sea bass, eels and other bottom dwelling species seeking food or shelter (Everhart and Youngs 1981; Hubert 1983). Pot fishing can be divided into two general classifications: 1) inshore potting in estuaries, lagoons, inlets and bays in depths up to about 75 m (250 ft.) and; 2) Offshore potting using larger and heavier vessels and gear in depths up to 730 m (2400 ft.) or more (Sainsbury 1996).

9.3.1.2.2.3.1.1 Lobster Pots

Lobster pots are typically rectangular and are divided into two sections, the chamber and the parlor. The chamber has an entrance on both sides of the pot and is usually baited. Lobsters then move to the parlor via a tunnel (Everhart and Youngs 1981). Escape vents are installed in both areas of the pot to minimize the retention of sub-legal sized lobsters (DeAlteris 1998).

Lobster pots are fished as either 1) a single pot per buoy (although two pots per buoy are used in Cape Cod Bay, and three pots per buoy in Maine waters), or 2) a "trawl" or line with up to 100 pots. According to NREFHSC (2002) there are a number of important features related to lobster pots and their use:

- About 95% of lobster pots are made of plastic-coated wire.
- Floating mainlines may be up to 7.6 m (25 ft.) off bottom.
- Sinklines are sometimes used where marine mammals are a concern.
- Neutrally buoyant lines may soon be required in Cape Cod Bay.
- Soak time depends on season and location - usually 1-3 days in inshore waters in warm weather, to weeks in colder waters.
- Offshore pots are larger (more than 1 m (4 ft) long) and heavier (~ 100 lb or 45 kg), with an average of ~ 40 pots/trawl and 44 trawls/vessel. They have a floating mainline and are usually deployed for a week at a time.
- There has been a three-fold increase in lobster pots fished since the 1960s, with more than four million pots now in use.

Although the offshore component of the fishery is regulated under federal rules, American lobster is not managed under a federal fishery management plan.

9.3.1.2.2.3.1.2 Fish Pots

Black sea bass pots are similar in design to lobster pots. They are usually fished singly or in trawls of up to 25 pots, in shallower waters than the offshore lobster pots or red crab pots. Pots may be set and retrieved 3-4 times per day when fishing for scup (NREFHSC 2002). This activity is managed under a federal fishery management plan. Hagfish pots (55 gallon plastic barrels fitted with a number of one-way entrance funnels) are fished in deep waters on mud bottoms. They are fished in strings of 20-200 traps and set for about six to twelve hours. Cylindrical pots are typically used for capturing eels in Chesapeake Bay, however, half-round and rectangular pots are also used and all are fished in a manner similar to that of lobster pots (Everhart and Youngs 1981). Hagfish and eel activities are not managed under a federal fishery management plan.

9.3.1.2.2.3.1.3 Crab Pots

Crabs are often fished with pots consisting of a wire mesh. A horizontal wire partition divides the pot into an upper and lower chamber. The lower chamber is entered from all four sides through small wire tunnels. The partition bulges upward in a fold about 20 cm (8 inches) high for about one third of its width. In the top of the fold are two small openings that give access to the upper chamber (Everhart and Youngs 1981).

Crab pots are always fished as singles and are hauled by hand from small boats, or with a pot hauler in larger vessels. Crab pots are generally fished after an overnight soak, except early and late in the season (DeAlteris 1998). These pots are also effective for eels (Everhart and Youngs 1981). This activity is not managed under a federal fishery management plan.

Deep sea red crab pots are typically wood and wire traps 1.2 m by 0.75 m (48 by 30 inches) with top entry. Pots are baited and soak for about 22 hours before being hauled. Currently, vessels are using an average of 560 pots in trawls of 75- 180 pots per trawl along the continental slope at depths from 400 to 800 m (1300 - 2600 ft). These vessels are typically 25 - 41 m (90 - 150 ft) in length. Currently there are about 6 vessels engaged in this fishery (NEFMC 2002). This activity is managed under a federal fishery management plan.

9.3.1.2.2.3.2 Traps

A trap is generally a large scale device that uses the seabed and sea surface as boundaries for the vertical dimension. The gear is installed at a fixed location for a season, and is passive, as the animals voluntarily enter the gear. Traps are made of a leader or fence, that interrupts the coast parallel migratory pattern of the target prey, a heart or parlor that leads fish via a funnel into the bay or trap section that serves to hold the catch for harvest by the fishermen. The non-return device is the funnel linking the heart and bay sections (DeAlteris 1998). This activity is not managed under a federal fishery management plan.

9.3.1.2.2.3.2.1 Fish Pound Nets

Pound nets are constructed of netting staked into the sea bed by driven piles (Sainsbury 1996). Pound nets have three sections: the leader, the heart, and the pound. The leader (there may be more than one) may be as long as 400 m (1300 ft) and is used to direct fish into the heart(s). One or more hearts are used to further funnel fish into the pound and prevent escapement. The pound may be 15 m (49 ft) square and holds the fish until the net is emptied. These nets are generally fished in waters less than 50 m (160 ft) deep. Pound nets are also used to catch crabs. This activity is not managed under a federal fishery management plan.

9.3.1.2.2.3.2.2 Fyke and Hoop Nets

Constructed of wood or metal hoops covered with netting, hoop nets are 2.5 to 5 m (8.2 - 16 ft) long, "Y-shaped" nets, with wings at the entrance and one or more internal funnels to direct fish inside, where they become trapped. Occasionally, a long leader is used to direct fish to the entrance. Fish are removed by lifting the rear end out of the water and loosening a rope securing the closed end. These nets are generally fished to about 50 m (160 ft) deep (Sainsbury 1996). A common fyke net is a long bag mounted on one or several hoops which keep the net from collapsing as well as provide an attachment for the base of the net funnels to prevent the fish from escaping. This gear is used in shallow water and extensively in river fisheries. (Everhart and Youngs 1981). This activity is not managed under a federal fishery management plan.

9.3.1.2.2.3.2.3 Weirs

A weir is a simple maze that intercepts species that migrate along the shoreline. Brush weirs are used in the Maine sardine/herring fishery. These are built of wooden stakes and saplings driven into the bottom in shallow waters. The young herring encounter the lead, which they follow to deeper water, finally passing into an enclosure of brush or netting. The concentrated fish are then removed with a small seine (Everhart and Youngs 1981). This activity is not managed under a federal fishery management plan.

9.3.1.2.2.3.2.4 Shallow Floating Traps

In New England, much of the shoreline and shallow subtidal environment is rocky and stakes can not be driven into the bottom. Therefore, the webbing of these traps is supported by floats at the sea surface, and held in place with large anchors. These traps are locally referred to as "floating traps." The catch, design elements and scale of these floating traps is similar to pound nets (DeAlteris 1998).

The floating trap is designed to fish from top to bottom, and is built especially to suit its location. The trap is held in position by a series of anchors and buoys. The net is usually somewhat "T-shaped," with the long portion of the net (the leader net) designed to funnel fish into a box of net at the top of the T. The leader net is often made fast to a ring bolt ashore (Sainsbury 1996). This activity is not managed under a federal fishery management plan.

9.3.1.2.2.4 Sink Gill Nets and Bottom Longlines

9.3.1.2.2.4.1 Sink/Anchor Gill Nets

Individual gill nets are typically 91 m (300 feet) long, and are usually fished as a series of 5-15 nets attached end-to-end. Gill nets have three components: leadline, webline and floatline. Fishermen are now experimenting with two leadlines. Leadlines used in New England are ~65 lb (30 kg.)/net; in the Middle Atlantic leadlines may be heavier. Weblines are monofilament, with the mesh size depending on the target species. Nets are anchored at each end, using materials such as pieces of railroad track, sash weights, or Danforth anchors, depending on currents. Anchors and leadlines have the most contact with the bottom. Some nets may be tended several times/day, (e.g., when fishing for bluefish in the Middle Atlantic). For New England groundfish, frequency of tending ranges from daily to biweekly (NREFHSC 2002). These activities are managed under federal fishery management plans.

9.3.1.2.2.4.2 Stake Gill Nets

Generally a small boat is used inshore so that a gill net is set across a tidal flow and is lifted at slack tide to remove fish. Wooden or metal stakes run from the surface of the water into the sediment and are placed every few meters along the net to hold it in place. When the net is lifted, the stakes remain in place. These nets are generally fished from the surface to about 50 meters deep (Sainsbury 1996). These activities are not managed under federal fishery management plans.

9.3.1.2.2.4.3 Bottom Longlines

Longlining for bottom species on continental shelf areas and offshore banks is undertaken for a wide range of species including cod, haddock, dogfish, skates, and various flatfishes (Sainsbury 1996). A 9.5 m (31 ft) vessel can fish up to 2500 hooks a day with a crew of one and twice that number with 2 crew members. Mechanized longlining systems fishing off larger vessels up to 60 m (195 ft) can fish up to 40,000 hooks per day (Sainsbury 1996).

In the Northeast up to six individual longlines are strung together, for a total length of about 460 m (1500 ft), and are deployed with 20-24 lb (9 - 11 kg) anchors. The mainline is parachute cord or sometimes stainless steel wire. Gangions (lines from mainline to hooks) are 38 cm (15 inches) long and 1-2 m (3-6 ft) apart. The mainline, hooks, and gangions all come in contact with the bottom. Circle hooks are potentially less damaging to habitat features than other hook shapes. These longlines are usually set for only a few hours at a time (NREFHSC 2002). Longlines used for tilefish are deployed in deep water, may be up to 40 km (25 miles) long, are stainless steel or galvanized wire, and are set in a zig-zag fashion (NREFHSC 2002). These activities are managed under federal fishery management plans.

9.3.1.2.2.5 Pelagic Gear

9.3.1.2.2.5.1 Mid-Water Otter Trawl

The mid-water trawl is used to capture pelagic species that school between the surface and the sea bed throughout the water column. The mouth of the net can range from 110 m to 170 m (360 - 560 ft.) and requires the use of large vessels (Sainsbury 1996). Successful mid-water trawling requires the effective use of various electronic aids to find the fish and maneuver the vessel while catching them (Sainsbury 1996). This activity is managed under federal fishery management plans. This gear is not expected to have contact with or impacts upon bottom habitats.

9.3.1.2.2.5.2 Paired Mid-Water Trawl

Pair-trawling is used by smaller vessels which herd small pelagics such as herring and mackerel into the net (Sainsbury 1996). Large pelagic species are also harvested with a huge pelagic pair trawl towed at high speed near the surface. The nets have meshes exceeding 10 m (33 ft.) in length in the jibs and first belly sections, and reduce to cod-end mesh sizes of 20 cm (8 inches) (DeAlteris 1998). This activity is managed under federal fishery management plans. This gear is not expected to have contact with or impacts upon bottom habitats.

9.3.1.2.2.5.3 Purse Seines

Purse seines are very efficient for taking pelagic schooling species. The purse seine is a continuous deep ribbon of web with corks on one side and leads on the other. Rings are fastened at intervals to the lead line and a purse line runs completely around the net through the rings (Everhart and Youngs 1981). One end of the net is fastened to the vessel and the other end to a skiff. The vessel then encircles a school of fish with the net, the net pursed and hauled back to the vessel. Purse seines vary in size according to the vessel size, the size of the mesh, the species sought and the depth to be fished. Tuna seines are nearly one kilometer (0.6 miles) long and fish from 55 - 640 m (180 - 2100 ft.) (Everhart and Youngs 1981). Due to the large depth of the net for tuna purse seines, they have been shown to contact and interact with the sea bottom when fishing in some shallow water locations such as Massachusetts Bay and vicinity (NMFS 2001). However, these interactions are unintended and rare. This activity is managed under federal fishery management plans.

9.3.1.2.2.5.4 Drift Gill Nets

Gillnets operate principally by wedging and gilling fish, and secondarily by entangling (DeAlteris 1998). The nets are a single wall of webbing, with float and lead lines. Drift gillnets are designed so as to float from the sea surface and extend downward into the water column and are used to catch pelagic fish. In this case the buoyancy of the floatline exceeds the weight of the leadline. Drift gillnets may be anchored at one end or set-out to drift, usually with the fishing vessel attached at one end (DeAlteris 1998). This activity is managed under federal fishery management plans. This gear is not expected to have contact with or impacts upon bottom habitats.

9.3.1.2.2.5.5 Pelagic Longline Gear

The pelagic or subsurface longline is a technique directed mostly towards tunas, swordfish, sailfish, dolphin (dorado), and sharks. The gear is typically set at depths from the surface to around 330 m (1100 ft.). The gear can also be set with a main line hanging in arcs below the buoy droplines to fish a band of depths (Sainsbury 1996). The gear is set across an area of known fish concentration or movement, and may be fished by day or night depending upon the species being sought (Sainsbury 1996). The length of the mainline can vary up to108 km (67 miles) depending on the size of the vessel. If the mainline is set level at a fixed depth, then the leader or gangion lengths vary from 2-40 m (6.6 - 130 ft.), so as to ensure the hooks are distributed over a range of depths (DeAlteris 1998). If a line-shooter is used to set the mainline in a catenary shape with regard to depth, then the gangions are usually a single minimal length, but are still distributed by depth (DeAlteris 1998). Each gangion typically contains a baited hook and chemical night stick to attract the fish. Traditional or circle hooks may be used. Swordfish vessels typically fish 20 to 30 hooks per 1.6 km (1 mile) of mainline between 5 and 54 km (3 - 34 miles) in length (Sainsbury 1996). This activity is managed under federal fishery management plans. This gear is not expected to have contact with or impacts upon bottom habitats.

9.3.1.2.2.5.6 Troll Lines

Trolling involves the use of a baited hook or lure maintained at a desired speed and depth in the water (Sainsbury 1996). Usually, two to four or more lines are spread to varying widths by the use of outrigger poles connected to the deck by hinged plates. Line retrieval is often accomplished by means of a mechanized spool. Each line is weighted to reach the desired depth and may have any number of leaders attached, each with a hook and bait or appropriate lure. This gear is generally fished from the surface to about 20 meters (Sainsbury 1996). This activity is managed under federal fishery management plans. This gear is not expected to have contact with or impacts upon bottom habitats.

9.3.1.2.2.6 Other Gear

9.3.1.2.2.6.1 Rakes

A bull rake is manually operated to harvest hard clams and consists of a long shaft with a rake and basket attached. The length of the shaft can be variable but usually does not exceed three times the water depth. The length and spacing of the teeth as well as the openings of the basket are regulated to protect juvenile clams from harvest (DeAlteris 1998). Rakes are typically fished off the side of a small boat. This activity is not managed under federal fishery management plans.

9.3.1.2.2.6.2 Tongs

Tongs are a more efficient device than rakes for harvesting shellfish. Shaft-tongs are a scissor-like device with a rake and basket at the end of each shaft. The fisherman stands on the edge of the boat and progressively opens and closes the baskets on the bottom gathering the shellfish into a mound. The tongs are closed a final time, brought to the surface, and the catch emptied on the culling board for sorting. The length of the shaft must be adjusted for water depth. Oysters are traditionally harvested with shaft tongs in water depths up to 6 m (21 ft.), with shaft tongs 8 m (29 ft.) in length (DeAlteris 1998). Patent tongs are used to harvest clams and oysters and are opened and closed with a drop latch or with a hydraulic ram and require a mechanized vessel with a mast or boom and a winch (DeAlteris 1998). Patent tongs are regulated by weight, length of teeth, and bar spacing in the basket. This activity is not managed under federal fishery management plans

9.3.1.2.2.6.3 Line Fishing

9.3.1.2.2.6.3.1 Hand Lines

The simplest form of hook and line fishing is the hand line. It consists of a line, sinker, leader and at least one hook. The line is usually stored on a small spool and rack and can vary in length. The line varies in material from a natural fiber to synthetic nylon. The sinkers vary from stones to cast lead. The hooks are single to multiple arrangements in umbrella rigs. An attraction device must be incorporated into the hook, usually a natural bait and artificial lure (DeAlteris 1998). Although not typically associated with bottom impacts, this gear can be fished in such as manner so as to hit bottom and bounce or be carried by currents until retrieved. This activity is managed under federal fishery management plans.

9.3.1.2.2.6.3.2 Mechanized Line Fishing

Mechanized line hauling systems have been developed to allow more lines to be worked by smaller crews and use electrical or hydraulic power to work the lines on the spools or jigging machines (Sainsbury 1996). These reels, often termed bandits, are mounted on the vessel bulwarks and have a spool around which the mainline is wound (Sainsbury 1996). Each line may have a number of branches and baited hooks, and the line is taken from the spool over a block at the end of a flexible arm. This gear is used to target several species of groundfish, especially cod and pollock and it has the advantage of being effective in areas where other gears cannot be used. Jigging machine lines are generally fished in waters up to 600 m (2000 ft) deep (Sainsbury 1996). This gear may also have the ability to contact the bottom depending upon the method selected to fish. This activity is managed under federal fishery management plans.

9.3.1.2.2.6.4 Hand Hoes

Intertidal flats are frequently harvested for clams and baitworms using hand-held hoes. These are short handled rake-like devices, which are often modified gardening tools (Creaser et. al. 1983). Baitworm hoes have 5 to 7 tines, 21 to 22 cm (8.3 - 8.7 ft) in length for bloodworms and 34 to 39 cm (13 - 15 inches) for sandworms. Clam hoes in Maine typically have 4 to 5 tines, 15 cm (6 inches) long (Wallace 1997). This activity is not managed under federal fishery management plans.

9.3.1.2.2.6.5 Diving

By either free diving or using SCUBA, divers collect crustaceans, mollusks and some reef fish in shallow water. Most often a support vessel is used to transport the diver(s) to the fishing site and carry the landings to port. In deeper waters, helmet diving systems are used and the diver is tethered to the vessel with air pumped from the surface. This method is most often used by sea urchin divers and some lobster divers. Divers normally use small rakes or hoes to scrape creatures off rocks or dig them out of the seabed. Generally, the catch is placed in bags which are either towed to the surface by the boat or floated to the surface using an air source and a lift bag. Divers rarely work deeper than about 20 m (66 ft) (Sainsbury 1996). This activity is not managed under federal fishery management plans.

9.3.1.2.2.6.6 Spears

Spears came into use when it was found that a pole or shaft with a point on it could be used by a fisherman operating from shore, floating raft, or boat to capture animals previously out-of-reach (DeAlteris 1998). However, the single prong spear required an accurate aim, and fish easily escaped. With the addition of a barb, fish retention was improved; and spears with multi-prong heads increased the likelihood of hitting the target. Spears were initially hand-held, then thrown, then placed in launching devices including cross-bows, spear guns for divers, etc. Spears with long shafts (gigs) are used by fishermen in small boats at night in the Carolina sounds for flounder, through the ice for eels in New England bays, and by divers for fish in coastal waters (DeAlteris 1998). This activity is not managed under federal fishery management plans.

9.3.1.2.3 Distribution of fishing activity by gear type

9.3.1.2.3.1 Introduction

This section of the document includes a series of GIS figures showing the distribution of fishing activity during 1995-2001 by ten minute "squares" of latitude and longitude for six commercial fishing gears that are extensively used in the U.S. Northeast region. Three of them (bottom trawls, scallop dredges, and hydraulic clam dredges) are mobile bottom-tending gears and three (pots, bottom gill nets, and bottom longlines) are fixed bottom-tending gears. Bottom trawls, longlines and gill nets are used to harvest groundfish that are managed by the New England Fishery Management Council. Groundfish are also caught incidentally (as by-catch) in pots, scallop dredges, and clam dredges. All six of these gears have the potential to adversely affect groundfish EFH for in the Northeast region, but the effects of fixed gear are minor compared to the effects of mobile bottom-tending gear (NREFHSC 2002). Also included in this section of the DEIS is an analysis of fishing activity for each gear type among four sub-regions and by surface sediment type within each sub-region and for the region as a whole.

9.3.1.2.3.2 Data Sources and Processing

The data used to perform this analysis were extracted from vessel trip report and clam logbook databases maintained at the U.S. National Marine Fisheries Service (NMFS) Northeast (NE) Regional Office in Gloucester, MA. Data included in the analysis are provided by vessels operating with federal permits that participate in the following fisheries: northeast multispecies; sea scallops; surf clams and ocean quahogs; monkfish; summer flounder; scup; black sea bass; squid, mackerel, and butterfish; spiny dogfish; bluefish; Atlantic herring; and tilefish. Vessels that operate strictly within state waters (generally inside three miles from shore) are not required to have a federal permit and therefore do not submit trip reports. For this reason, fishing trips in some nearshore ten minute squares that include a significant proportion of state waters are under-represented.

Permit holders are required to fill out a VTR form or make a logbook entry for each trip made by the vessel, i.e., each time the vessel leaves and returns to port. In cases where more than one statistical area is fished or the gear is changed during the same trip, a separate report is completed. Fishermen are given the choice of reporting the location of a trip as a point (latitude and longitude or Loran bearings) or just as a statistical area. Only trips that were reported as a point location and therefore could be assigned to a 10 minute square were included in this analysis. Most trips are reported this way. Fishermen report the general location where most of their fishing effort occurred during a trip and the date and time that the vessel left and returned to port. They are also asked to record the number of hauls (tows or sets) made during the trip and the average tow or soak time when the gear was fishing, but this information was judged to be too unreliable and incomplete for use in this analysis. Logbook entries in the clam dredge fishery include time spent fishing and these data were used in this analysis.

VTR and logbook data used in this analysis were compiled for the years 1995-2001. Scallop dredge and otter trawl fishing activity was calculated as the total number of days absent from port during the seven-year period. Days absent for each mobile gear trip were calculated based on the date and time of departure from and return to port in hours and converted to fractions of 24-hr days. Hydraulic clam dredge fishing activity was calculated as days (24 hrs) spent fishing based on the number of hours spent on each trip and excluded trips made by "dry" quahog dredge vessels in Maine. Fishing activity for the three fixed gear types was expressed as the number of trips reported in each ten minute square (TMS).

Days absent calculations for trawl and dredge vessels are clearly preferable to simply summing the number of trips, but over-estimate actual fishing time since they include travel time and any other non-fishing-related activity while vessels are away from port. Thus, the GIS plots and analyses presented here do not represent fishing effort. They were only used to indicate the relative, not the absolute, distribution of fishing activity by geograhical area and sediment type. Toward this end, all GIS input data were compiled and sorted into three categories: low, medium, and high degrees of activity that corresponded to cumulative percentages of 90, 75, and 50% of the total number of days at sea, or days spent fishing for each gear type during the seven-year time period. Data reported from TMS south of Cape Hatteras, North Carolina (35° N) and north of 45° N latitude in the Gulf of Maine were excluded from analysis, as were TMS-binned data from the low end (cumulative percentages >90%) of the frequency distribution. Exclusion of "low end" data (TMS with only a few trips or days) eliminated a large number of spatially misreported trips from analysis.

Also included in this section are GIS plots of fishing activity for scallop dredge vessels operating in the limited access fishery during 1998, 1999, and 2000 which were derived from vessel monitoring systems (VMS) placed aboard each vessel (Rago and McSherry 2001). These plots provide a much more detailed depiction of fishing activity for dredge vessels during these three years than VTR data since they are collected at much higher spatial and temporal resolutions. Data were collected at 20-minute intervals during the time when vessel speed was less than 5 knots in order to differentiate between fishing activity and steaming time and then binned into one nautical mile squares. It is recognized that fishing activity includes other activities besides dredging, e.g., shucking time.

9.3.1.2.3.3 Data Analysis

In each plot, the number of trips or days that accounted for 90% (cumulative) of the total number of trips or days was given as "N" in the title of each figure. Depth contours shown in these figures are for 50 and 100 fathoms. The U.S.-Canada border is shown as a black line and the outer boundary of the U.S. Exclusive Economic Zone (EEZ) is also shown. Ten minute squares that account for 90% of total fishing activity (i.e., all the TMS shown in the low, medium, and high distribution plots) were overlaid as open TMS on sediment types in a second series of GIS plots for each gear type. The surficial sediment layer was modified from a GIS data layer originally made available as a series of hard copy maps by Poppe et al. (1989) and available on a USGS CD-ROM. The original data layer included nine sediment types. For this analysis, silt and clay sediment categories were re-defined as "mud." This resulted in a simplified set of six sediment categories, which were re-named bedrock, gravel, gravelly sand, sand, muddy sand, and mud (Figure 240).

Data were allocated to TMS within the Northeast region (delimited by 35° N latitude) and to four sub-regions, the Gulf of Maine (GOM), Georges Bank (GB), southern New England (SNE), and the Mid-Atlantic (MA). These sub-regions are shown in Figure 241. Each sub-region, and the NE region of which each formed a part, were bounded inshore to exclude state waters and offshore by the 500 fathom depth contour. Boundaries between sub-regions were defined along ten minute parallels of latitude and meridians of longitude so that the only partial TMS were those that intersected with either the inshore or offshore limits of the region. Input files of VTR and logbook data were joined with shape files for each sub-region and the number of trips, days at sea, or days fishing, and the area (in square decimal degrees) encompassed by all the TMS – or portions of TMS – in each fishing activity category (50, 75, and 90%), were calculated.

For the "low" (90%) level of fishing activity, the percentage of the total number of trips or days that occurred in each sub-region during the six or seven-year time period was calculated. Also, the spatial extent to which each sub-region (and the entire NE region) was "fished" by each gear type was calculated as the proportion of the total area within each sub-region that was included within all the designated TMS. For bottom trawls, the amount of closed area on GB and in SNE was deducted from the total area in each sub-region. (All the other gear types had access to these areas for all or a portion of the 1995-2001 time period).

It is important to understand that all calculations involving "area fished" grossly over-estimate the amount of bottom area actually affected by fishing because bottom-tending gear in most cases are not used throughout any given TMS that was assigned to a fishing activity category. This would be particularly true for TMS at the low (90%) end of the distribution, i.e., TMS in which fishing activity is very sparse. Area analyses were only intended to reveal relative differences in the degree of fishing activity between gear types and sub-regions.

Analyses of percent area "fished" were conducted for each gear type and sub-region in terms of the percentage of the total area of each sediment type present in each sub-region was "fished" at the 90% level. These analyses were limited by the very general nature of the available sediment coverage data, and, as mentioned above, by the fact that fishing may take place within a relatively small proportion of the area within a TMS (which covers about 77 square nautical miles), and on a bottom type that either makes up a small proportion of the whole TMS or isn't even represented in the sediment database.

9.3.1.2.3.4 Results

9.3.1.2.3.4.1 Bottom Gill Nets

Bottom gill net trips were made primarily in the GOM (Figure 247 and Figure 248). In none of the other three sub-regions did gill net trips exceed 25% of the total number of gill net trips reported for the entire Northeast region. Gill net trips were reported from a larger area of federal waters in the Northeast region than pot or longline trips (Figure 247). Ten minute squares (TMS) where 90% of the gill net trips were made extended over a larger proportion of the GOM and a smaller proportion of GB, with intermediate values in SNE and the MA sub-regions. Gill net trips were most common in coastal waters in the southwestern portion of the GOM, with some trips reported offshore in the central portion of the gulf (Figure 242). No gill net fishing was reported in coastal waters of central and eastern Maine. Outside the GOM, gill net trips were reported along the western edge of the Great South Channel, in Rhode Island coastal waters, along the south shore of Long Island, and off New Jersey, the Delaware-Maryland-Virginia (DelMarVa) peninsula, and North Carolina. A few trips were also made in three TMS along the 100 f contour at the shelf break in SNE and (apparently) in a single TMS in even deeper water southeast of Hudson Canyon. Gill net trips were more numerous during 1995-2001 than bottom longline trips, but not as numerous as pot trips.

Ten minute squares that accounted for 90% of the gill net fishing trips during 1995-2001 were associated with a higher percentage of sand, gravelly sand, and gravel in the Northeast region than was the case for the other two fixed gear types (Figure 249). All three fixed gear types were used to a much greater extent on mud bottom in the GOM and on sand in the other three sub-regions, reflecting the distribution of sediment types by sub-region (Figure 248). Gill net trips were more strongly associated with coarser sediments in the GOM, SNE, and the MA and with mud and muddy sand in the GB sub-region (Figure 248).

9.3.1.2.3.4.2 Bottom Longlines

Bottom longlining during 1995-2001 was conducted primarily in coastal waters of the southwestern GOM and extended southeast of Cape Cod along the western edge of the Great South Channel Figure 243). A few trips were also reported on the northern edge of GB, in the outer portion of the GOM, in SNE coastal waters, and at scattered locations along the outer continental shelf. Almost all longline trips were reported in the GOM and GB sub-regions, with approximately twice as many in GB (Figure 247). The proportion of each sub-region where 90% of the longline trips were reported diminished from north to south. Of the three fixed gear types, longlines accounted for fewer trips during 1995-2001 than pots or bottom gill nets. Longline trips were also reported from TMS that occupied a smaller percentage of the Northeast shelf area than pot or gill net trips (Figure 242).

Like the other two fixed gear types, bottom longline trips were most commonly reported from TMS in sandy bottom areas, but in relation to the areal extent of each sediment type present in the NE region, longlining was more closely associated with gravelly sand and gravel (Figure 249). Longlining was reported from a very low proportion of mud in the GOM and GB sub-regions, and from a high proportion of sand in the GOM and gravelly sand and gravel areas in the GB sub-region (Figure 248). The low number of trips in SNE were more strongly associated with gravelly sand than with any other sediment type.

9.3.1.2.3.4.3 Pots

Pot fishing trips were distributed primarily throughout GOM coastal waters and in SNE (Figure 247). Trips were also reported from a few TMS along the U.S.-Canada border in the GOM, along the shelf break, and in inshore locations in the New York Bight and southern New Jersey and off the DelMarVa peninsula. Lobster pots accounted for 90% of the total number of trips and dominated pot fishing activity in the GOM and SNE. Hagfish pots (not shown) were used in more offshore waters of the GOM, fish pots (not shown) primarily in coastal SNE waters and in a large area of the mid-Atlantic between southern New Jersey and Cape Henry, and at the tip of the DelMarVa peninsula, and conch and whelk pots (not shown) in Nantucket Sound and off the DelMarVa peninsula. Crab pot trips (not shown) were reported from a number of scattered TMS, but there was a cluster on the southeastern flank of GB and inside the North Carolina barrier islands. The analysis of total pot fishing trips by sub-region – which excludes some data from TMS located inside state waters – revealed, not surprisingly, that most trips were reported in the GOM sub-region (Figure 247). Of the other three sub-regions, SNE accounted for more trips and area than the other two sub-regions, although a notable percentage of the area (but not number of trips) represented by the 90% TMS occurred in the mid-Atlantic sub-region. The extent of pot fishing in the GB sub-region during 1995-2001 was negligible.

Pot fishing trips occurred most often on mud bottom in the GOM and on sand in the other three sub-regions (Figure 248). In proportion to the amount of each sediment type present in each sub-region, pot fishing was more closely associated with sand, gravelly sand, and gravel substrates in the GOM, and with mud, sand, and gravelly sand in SNE. Ten minute squares that accounted for 90% of pot fishing activity in the mid-Atlantic did not represent more than 20% of any sediment type in the region. On GB, where even fewer trips were reported, no more than 12% of any sediment type was associated with 90% TMS.

9.3.1.2.3.4.4 Bottom Trawls

Bottom trawling in federal waters in the Northeast region during 1995-2001 accounted for more than twice as many days absent as scallop dredging and was represented in more than twice as much area (Figure 250). Significant areas were closed to bottom trawlers during the seven-year period (15% of GB and 5% in SNE). These areas account for the large gaps in the distribution of trawling activity on GB and SNE. Bottom trawling, more than any other gear type, was also conducted to a greater extent in deeper water in the GOM, north of GB, and along the shelf break in SNE and the mid-Atlantic. A continuous area of high trawling activity occurred from the central GOM west to the coast, then through the southwestern GOM, down the west side of the Great South Channel and east across the top of Closed Area I on GB. Trawling was also reported west and south of Closed Area II on eastern GB, on the southern portion of GB, throughout most of SNE in inner, mid, and outer shelf waters, along the shelf break in the mid-Atlantic, and in North Carolina coastal waters. There was a large area with no significant amount of trawling in the middle and inner portions of the mid-Atlantic shelf from the New York Bight south to the North Carolina border.

Analysis of VTR data by region showed that trawling activity was fairly evenly distributed among the four regions of the Northeast shelf (Figure 250). The GOM and GB regions, however, ranked somewhat higher than SNE and the mid-Atlantic in most cases. In terms of the area included in TMS that accounted for 90% of the reported number of days absent from port, a larger proportion of the SNE region was trawled than was trawled in any of the other regions and the mid-Atlantic region the least affected. Trawling was distributed over a high proportion of total area in all regions except the mid-Atlantic where it was no more extensive than scallop dredging and only slightly more extensive than hydraulic clam dredging.

Bottom trawling was widely distributed on a variety of substrates in the NE region, but appeared to be more widespread on mud bottom in the GOM and on sand and gravel in the other three regions where coarser substrates are more common (Figure 251). Analysis of VTR data according to sediment type indicated that bottom trawling was less common on sandy substrates in the NE region than dredging and more common on mud and muddy sand than the other two mobile gear types (Figure 252). In terms of the total amount of each sediment type present in the NE region, trawling was distributed over a much higher percentage of mud and muddy sand bottom than dredges and also ranked higher than dredges on sand and gravel and about the same as scallop dredges on gravelly sand. Trawling activity was extensively distributed over all five sediment types in the GOM, GB, and SNE regions (Figure 251). In the mid-Atlantic region, a much smaller proportion of sand and gravelly sand was trawled and no trawling was reported in the very small amount of gravel present in this region.

Otter trawls are used in the mid-Atlantic to harvest scallops. The primary fishing ground (not shown) is located along the shelf break between 37° and 40° N latitude on sandy bottom. They are also used to harvest pandalid shrimp in the Gulf of Maine and penaeid shrimp in North Carolina. Shrimp trawling takes place mostly in coastal and estuarine waters.

9.3.1.2.3.4.5 Scallop Dredges

Scallop dredging in federal waters in the Northeast region during 1995-2001 accounted for less than half as many days absent as bottom trawling, but nearly ten times more time at sea than was spent dredging with hydraulic clam dredges (Figure 250). Portions of the three areas on GB that were closed in 1995 to all bottom-tending gears capable of catching groundfish (including scallop dredges) were opened to scallop dredges in 1999 and 2000. (These areas were therefore included in the spatial calculations of scallop dredging activity for the whole time period). Scallop dredging during 1995-2001 was reported in TMS along the eastern Maine coast, in the extreme southwestern "corner" of the GOM north of Cape Cod, along the western side of the Great South Channel, along the northern edge of GB and on its southeastern flank, and in a very large continuous area reaching from the eastern end of Long Island south across the shelf and in outer shelf waters as far south as the North Carolina border (Figure 245). Large expanses of bottom area in the outer GOM, on the top of GB, in SNE, and in inner shelf waters of the mid-Atlantic did not support any scallop dredging at the 50-90% activity levels. Unlike bottom trawling, scallop dredging was almost completely confined to depths shallower than 50 fathoms. Analysis of VTR data by sub-region showed that about half of the reported scallop dredging days at sea were in the MA region, about 30% in the GB region (the same proportion as for trawls), 10% in SNE, and 5% or less in the GOM (Figure 250). Expressed as a percentage of the total area included within the 90% TMS in each region, the MA region again ranked first, followed by GB, SNE, and the GOM, as before.

Scallop dredging was confined mostly to sandy substrates in the mid-Atlantic region, was common on sand, gravel, and gravelly sand on GB, and (apparently) on mud and sand bottom areas in the GOM (Figure 250 and Figure 251). Large areas of sand in shallower water on GB, and sand, muddy sand, and mud in SNE were not dredged during 1995-2001. Throughout the NE region, scallop dredging was reported for TMS that included a high proportion of sand and very low proportions of any other sediment type (Figure 252). In the two sub-regions where most scallop dredging occurred (GB and mid-Atlantic), fishing was increasingly more common on coarser substrates (Figure 251). The same trend was observed for the entire Northeast region (Figure 250). In the GOM, a very low percentage of mud in the entire region was dredged; sand ranked the highest, with intermediate values for muddy sand, gravelly sand and gravel. In SNE, only sand and gravelly sand supported any significant amount of scallop dredging.

9.3.1.2.3.4.6 Hydraulic Clam Dredges

Fishing activity by hydraulic clam dredge vessels was compiled as time spent fishing and so could not be directly compared with time at sea for scallop dredge and bottom trawl vessels. Nevertheless, clam dredging activity was clearly less intensive during 1995-2001 than for either of the other two major types of mobile gear (Figure 250). The area represented by TMS that accounted for 90% of the total clam dredging activity was about half the area where most scallop dredging was reported and one-fourth the area where most bottom trawling was reported. Hydraulic dredging accounted for a higher percentage of days fished and area in the mid-Atlantic region than in SNE. Hydraulic dredges were used in a larger percentage of SNE than scallop dredges, and a smaller percentage of the mid-Atlantic. Hydraulic clam dredging took place in SNE and the mid-Atlantic, generally in shallower shelf waters than scallop dredging and trawling. A cluster of TMS off the New Jersey coast was heavily fished, as were other TMS further out toward the edge of the shelf, south of Long Island, and in SNE waters (Figure 246). Clam dredges do not operate on GB because ocean quahogs on the bank contain red tide-causing micro-organisms and can not be harvested. Hydraulic clam dredging is restricted to sandy and muddy sand substrates because the gear can be damaged in hard bottom areas (NREFHSC 2002). For this reason, hydraulic dredges are not used in the GOM.

Like the other two mobile gears, hydraulic dredges were used primarily on sandy bottom in the NE region (Figure 252). Relative to the amount of each sediment type available in the NE region, hydraulic dredges were used more on sand and gravelly sand than on gravel and muddy sand. Sand and gravelly sand were more extensively dredged than muddy sand in SNE and gravel and gravelly sand more extensively than sand and muddy sand in the MA region (Figure 251).

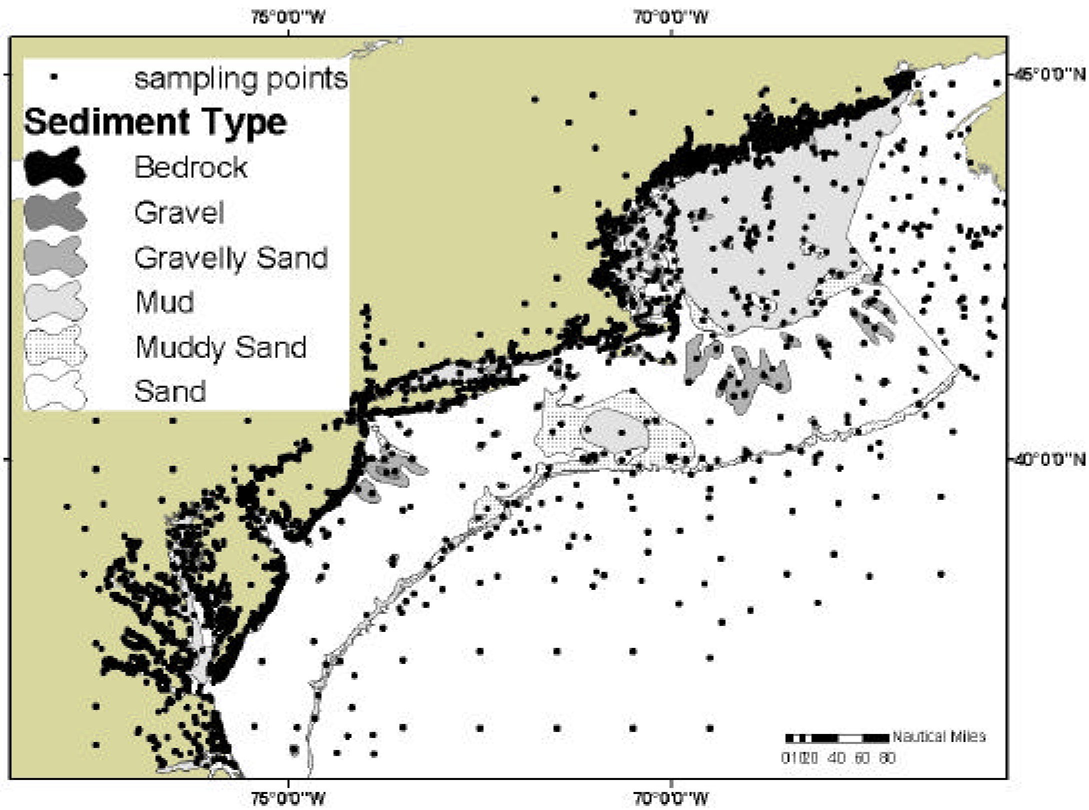


Figure 240 - Distribution of surficial sediments and sampling locations in the U.S. Northeast region (modified from Poppe *et al.* 1986)

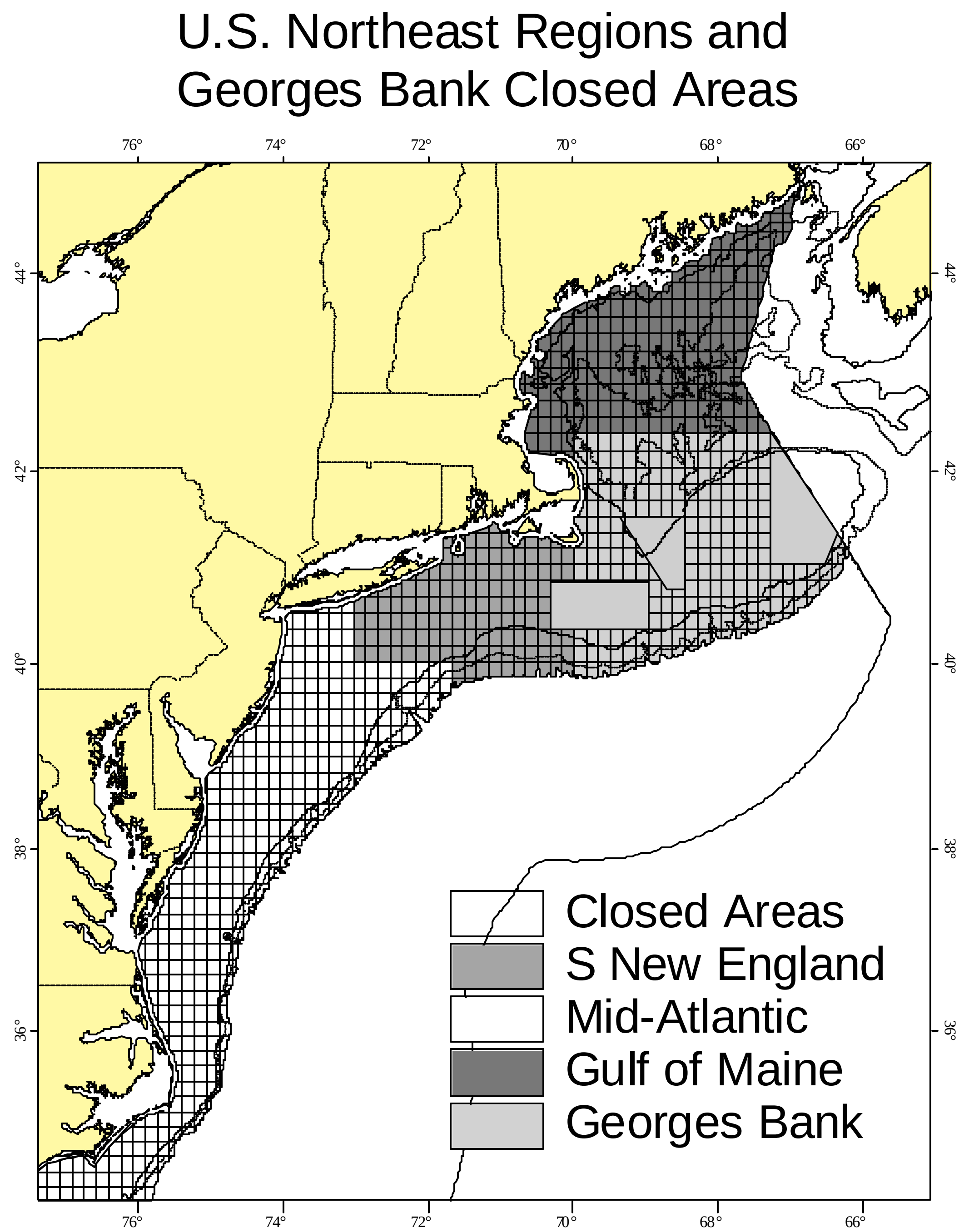
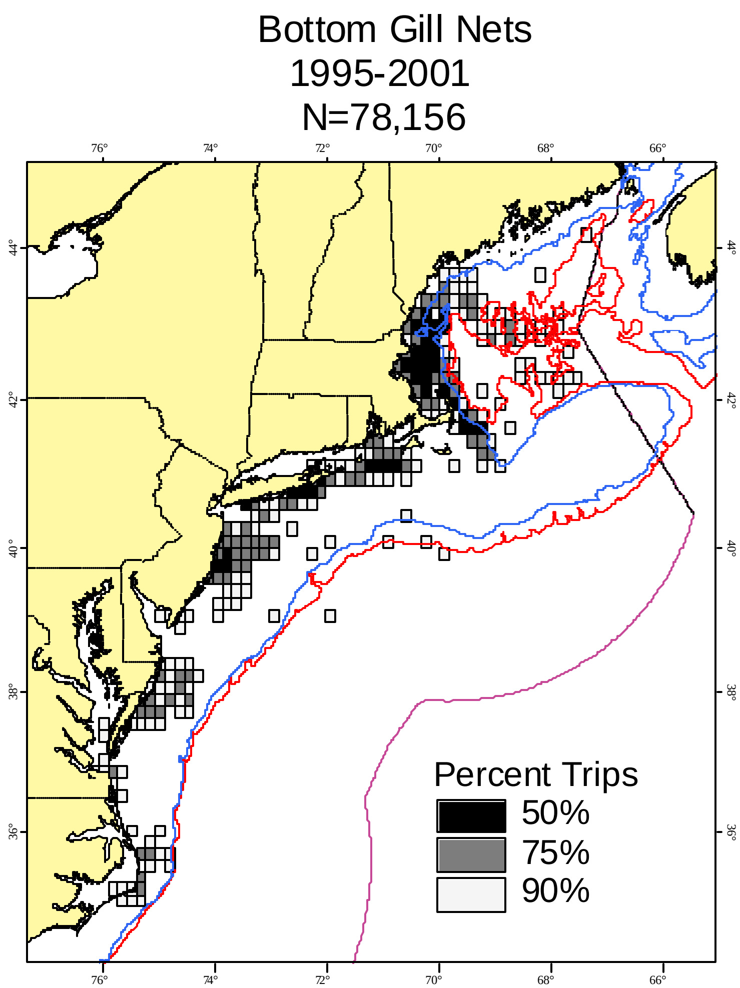


Figure 241 – Sub-regions of the U.S. Northeast shelf and areas on Georges Bank closed to bottom trawling since 1995



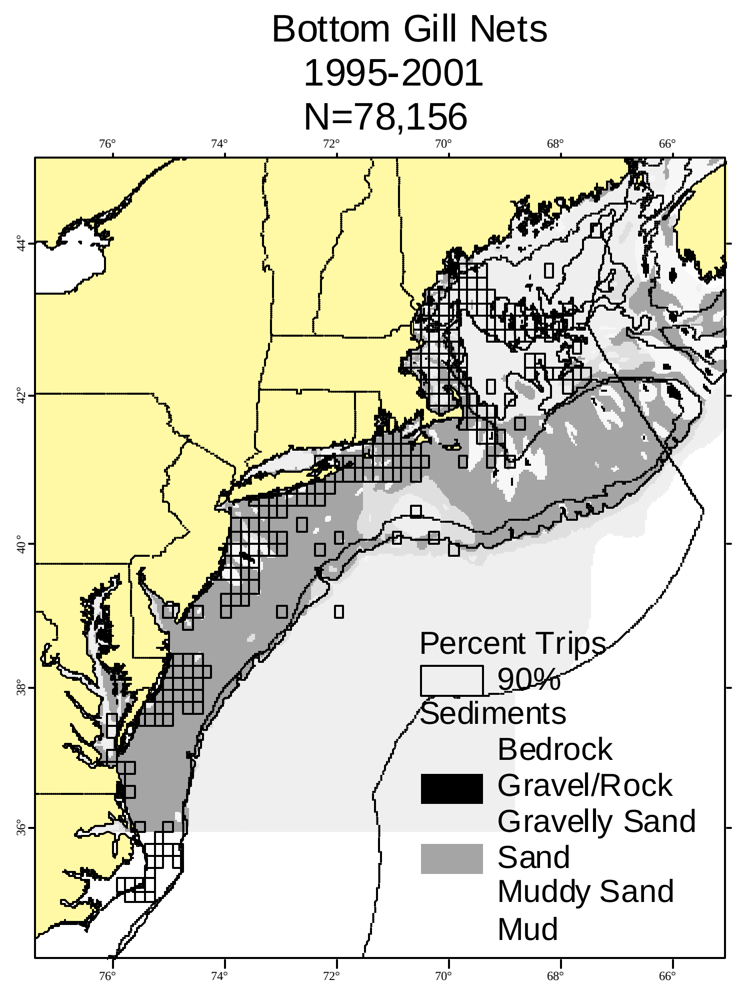


Figure 242 - Spatial distribution of ten minute squares (TMS) that account for high (50%), medium (75%), and low (90%) levels of fishing activity by bottom gill nets in the U.S. Northeast region and overlays of 90% TMS on sediments.

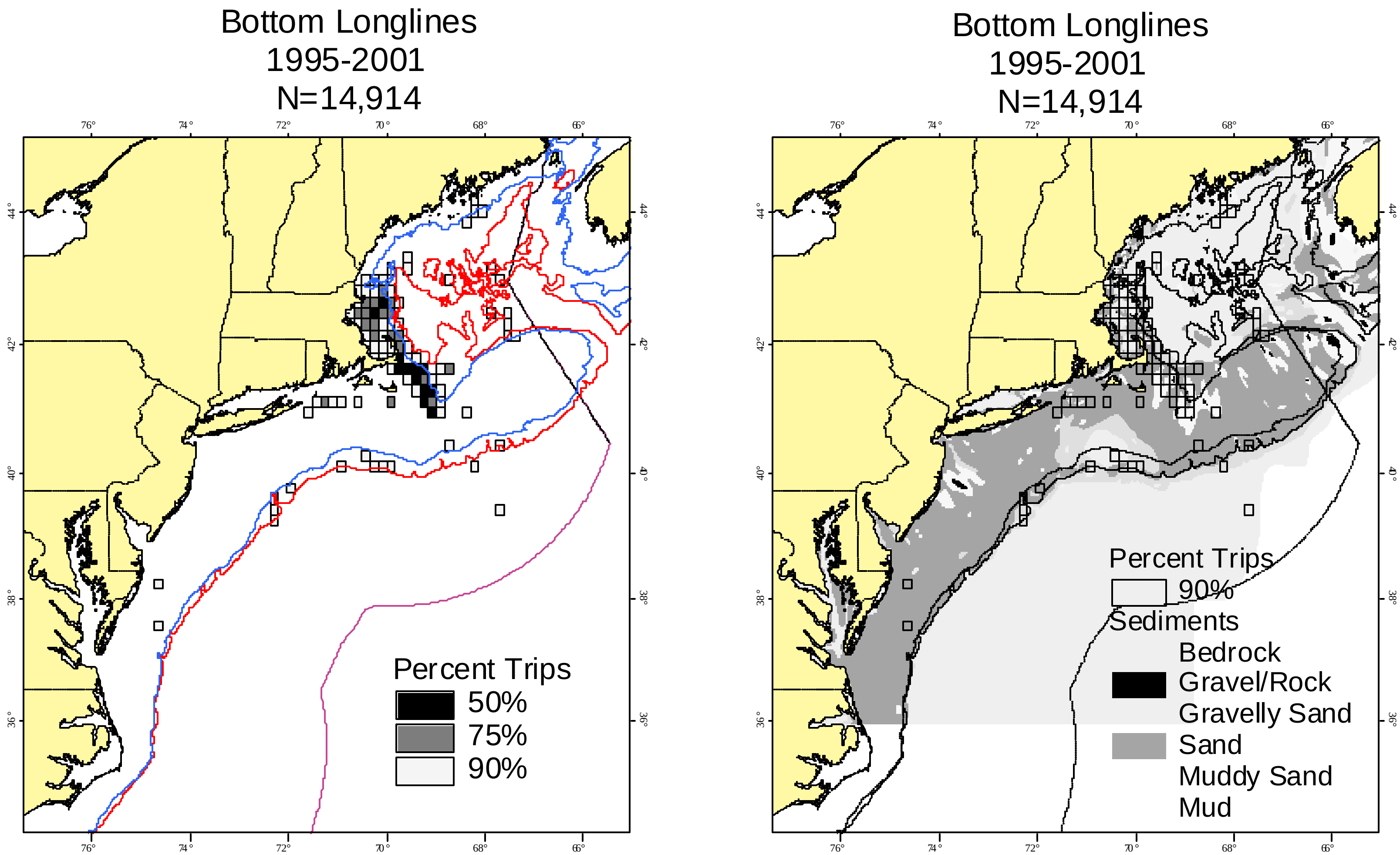


Figure 243 - Spatial distribution of ten minute squares (TMS) that account for high (50%), medium (75%), and low (90%) levels of fishing activity by bottom longlines in the U.S. Northeast region and overlays of 90% TMS on sediments.

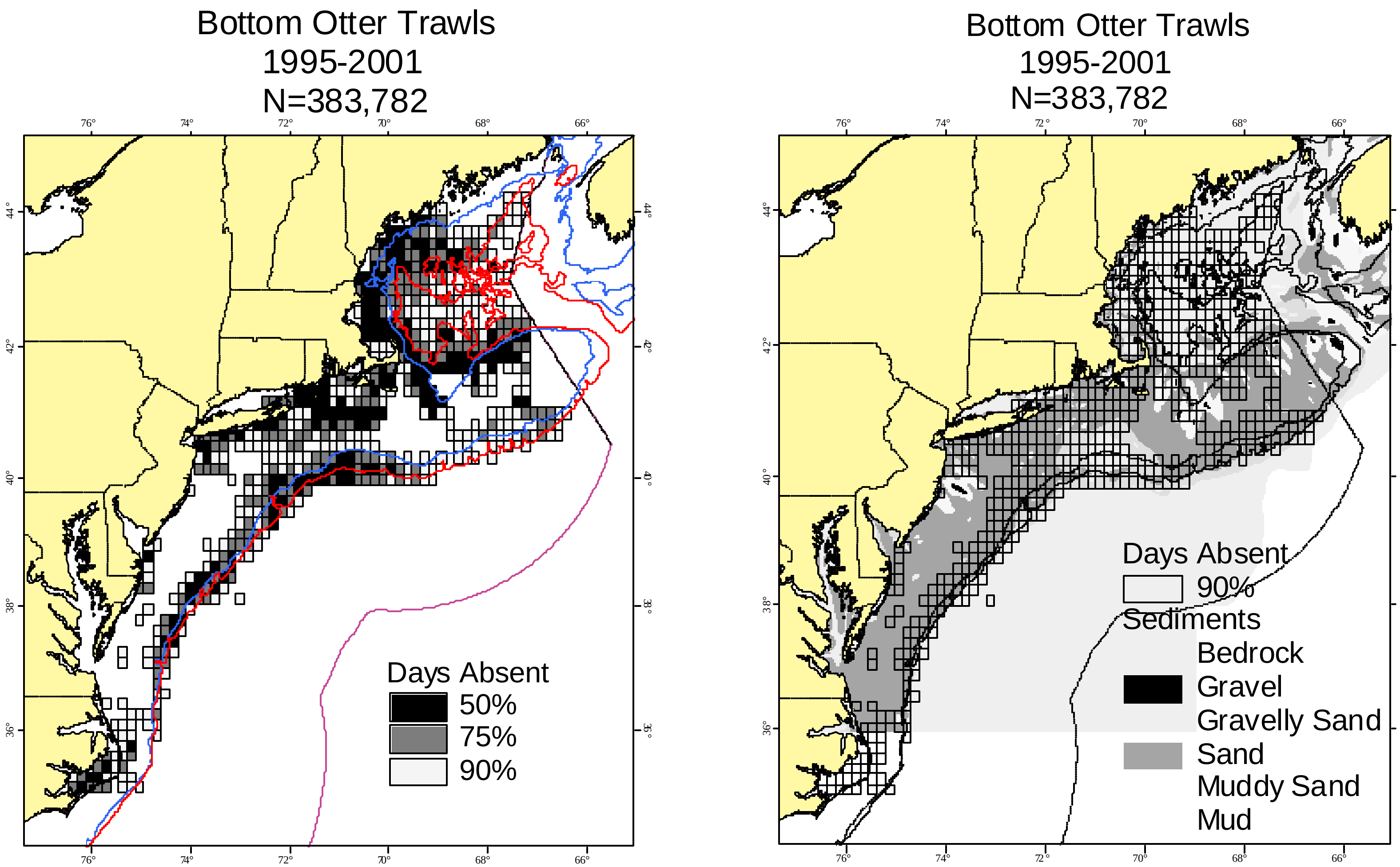


Figure 244 - Spatial distribution of ten minute squares (TMS) that account for high (50%), medium (75%), and low (90%) levels of fishing activity by bottom otter trawls in the U.S. Northeast region and overlays of 90% TMS on sediments.

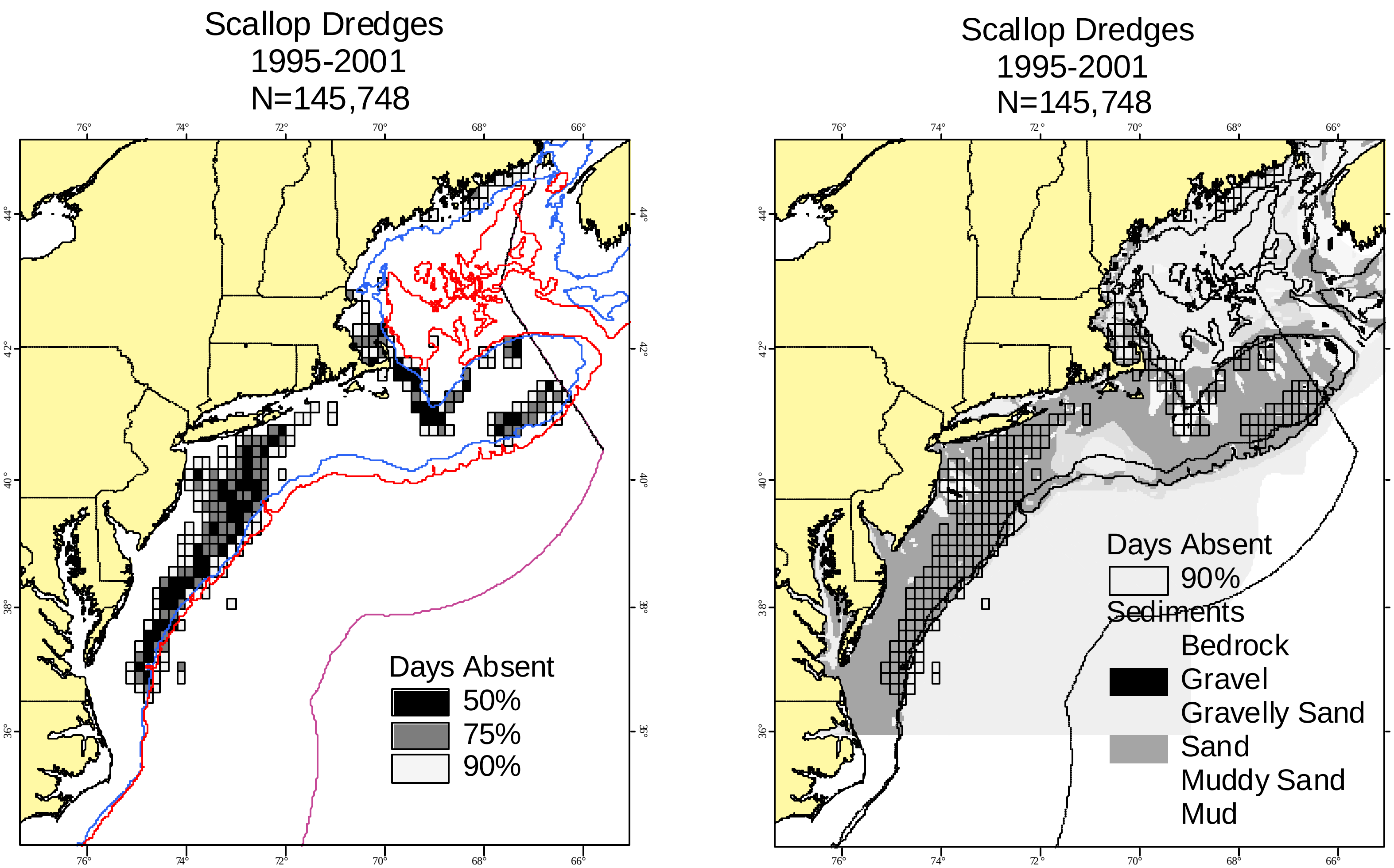


Figure 245 - Spatial distribution of ten minute squares (TMS) that account for high (50%), medium (75%), and low (90%) levels of fishing activity by scallop dredges in the U.S. Northeast region and overlays of 90% TMS on sediments.

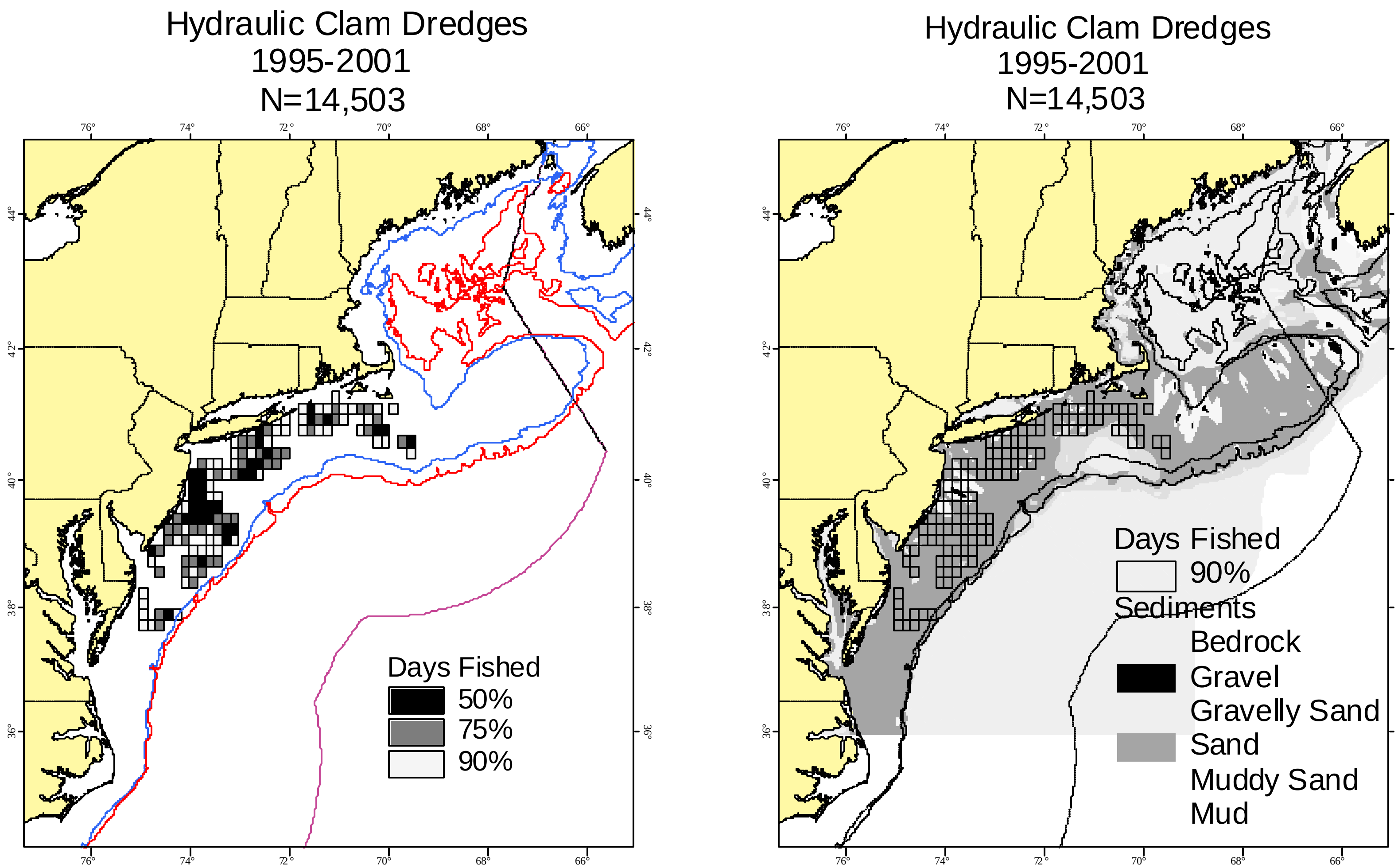


Figure 246 - Spatial distribution of ten minute squares (TMS) that account for high (50%), medium (75%), and low (90%) levels of fishing activity by hydraulic clam dredges in the U.S. Northeast region and overlays of 90% TMS on sediments.

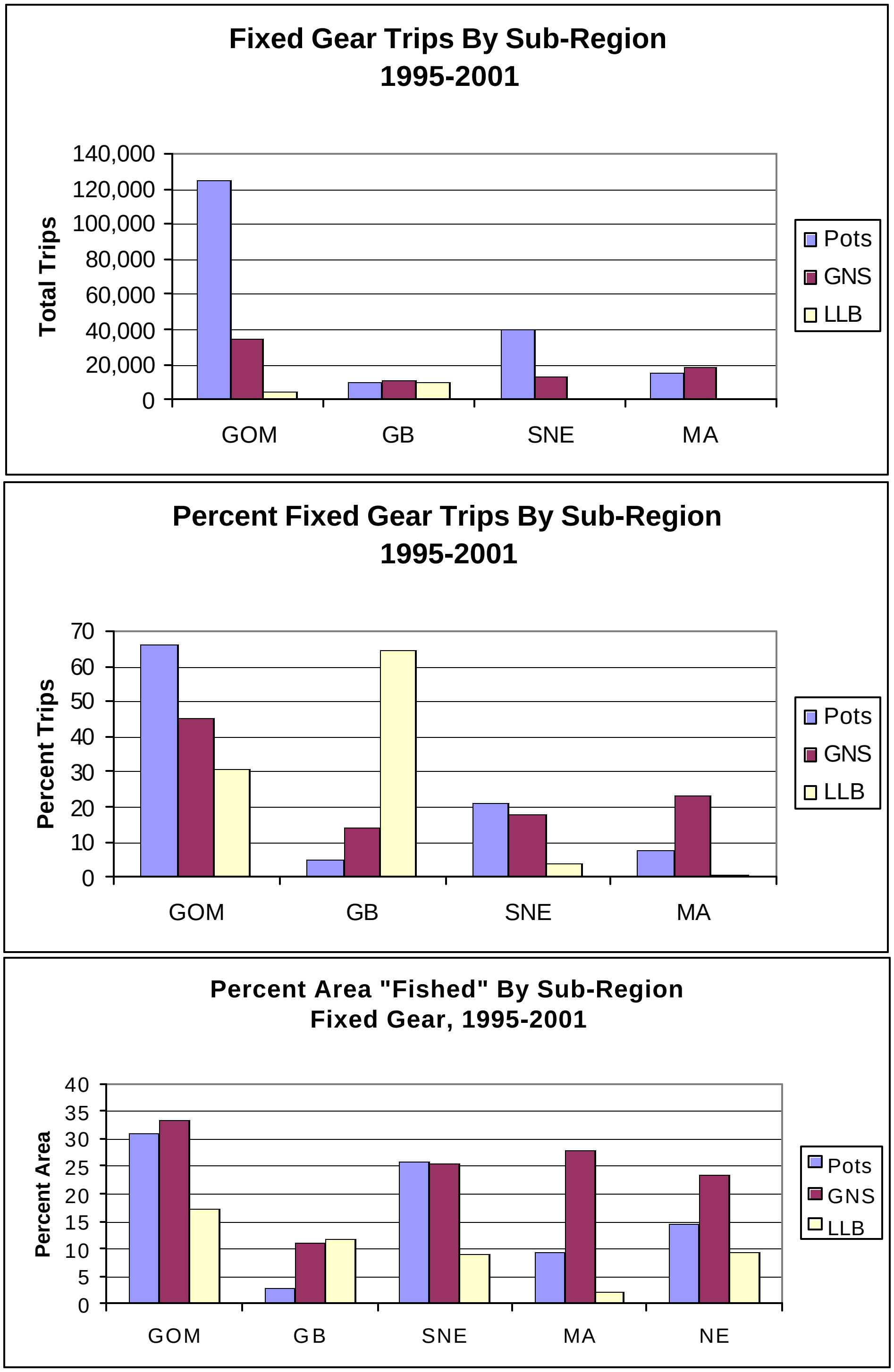


Figure 247 - Total and percent trips for the three principal fixed gear types used in the Northeast region by sub-region (top two graphs) and percent of total area in each sub-region and in the entire NE region occupied by TMS that account for 90% of the total fishing activity by each gear type (bottom graph).

GOM = Gulf of Maine, GB = Georges Bank, SNE = southern New England, MA = Mid-Atlantic, Pots = all pots, GNS = bottom gill nets, and LLB = bottom longlines.

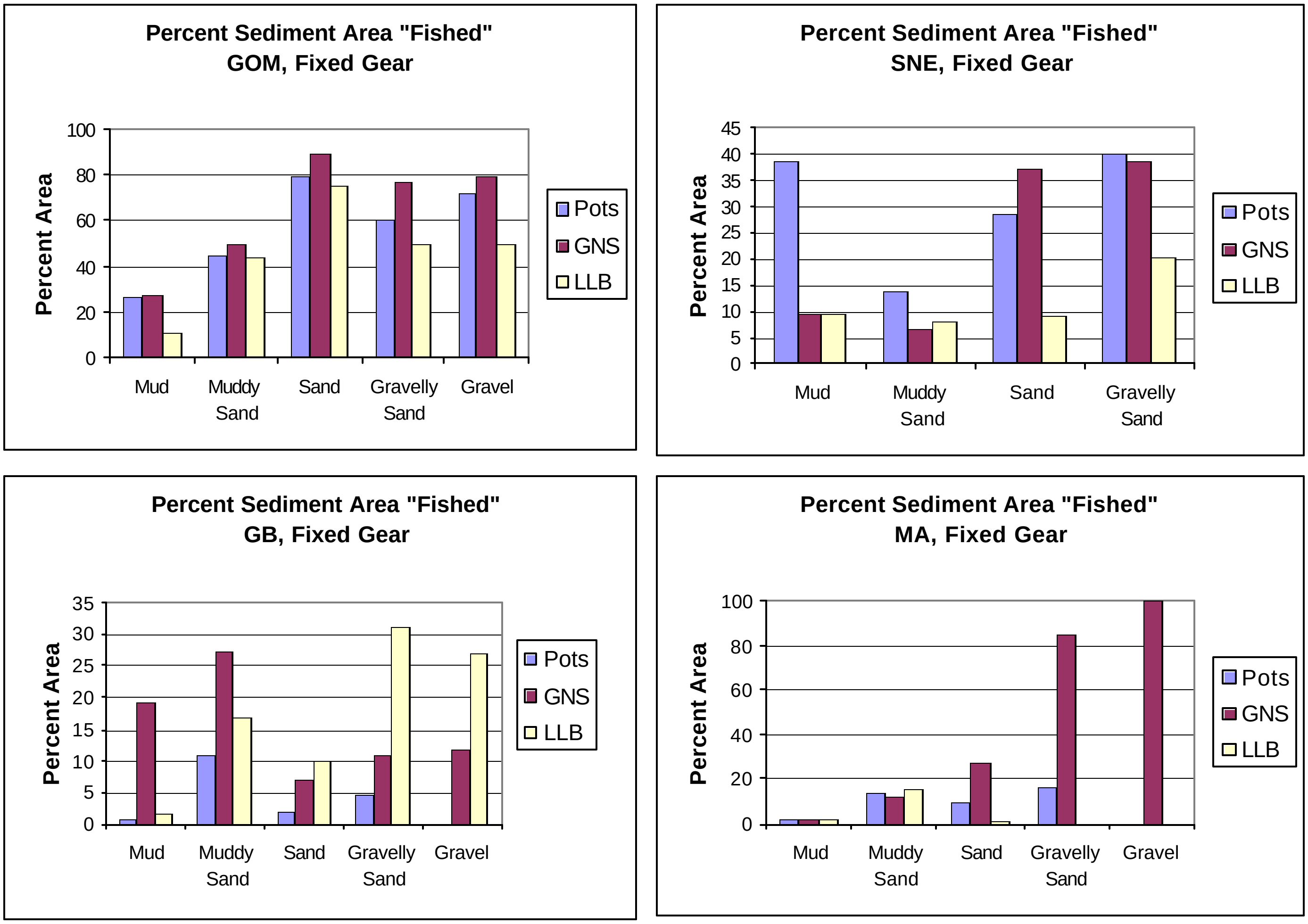


Figure 248 - Relative distribution of fishing activity by sediment type for vessels fishing with pots, bottom gill nets (GNS), and bottom longlines (LLB) as a percentage of the area occupied by TMS that accounted for 90% of the total number of trips in four sub-regions of the U.S. NE region.
GOM = Gulf of Maine, GB = Georges Bank, SNE = southern New England, and MA = Mid-Atlantic.
"Area fished" estimates are based on the area included in TMS that accounted for 90% of total fishing activity by bottom trawl (BT), scallop dredge (DRS), and hydraulic clam dredge (HYD) vessels.

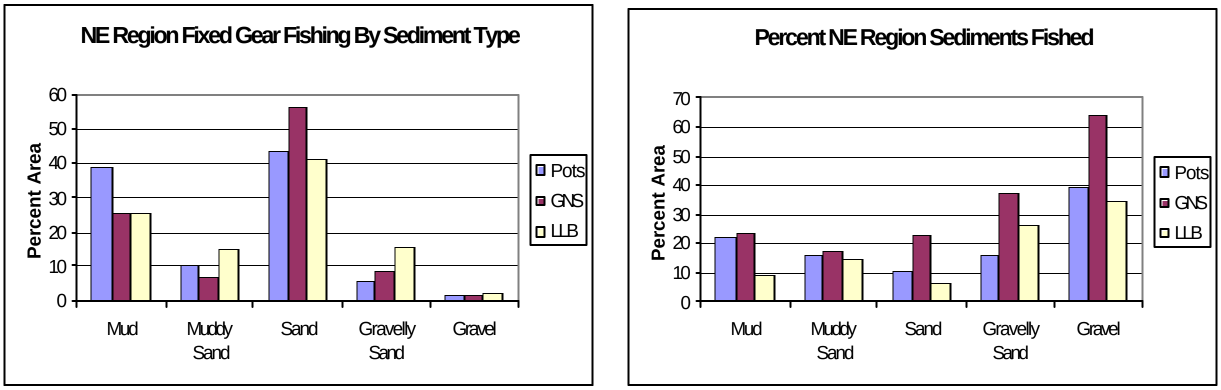


Figure 249 - Percent area by sediment type and percent area of each sediment type that was included in ten minute squares that accounted for 90% of total fishing activity by pots, bottom gill nets, and bottom longlines during 1995-2001 in the U.S. Northeast region.

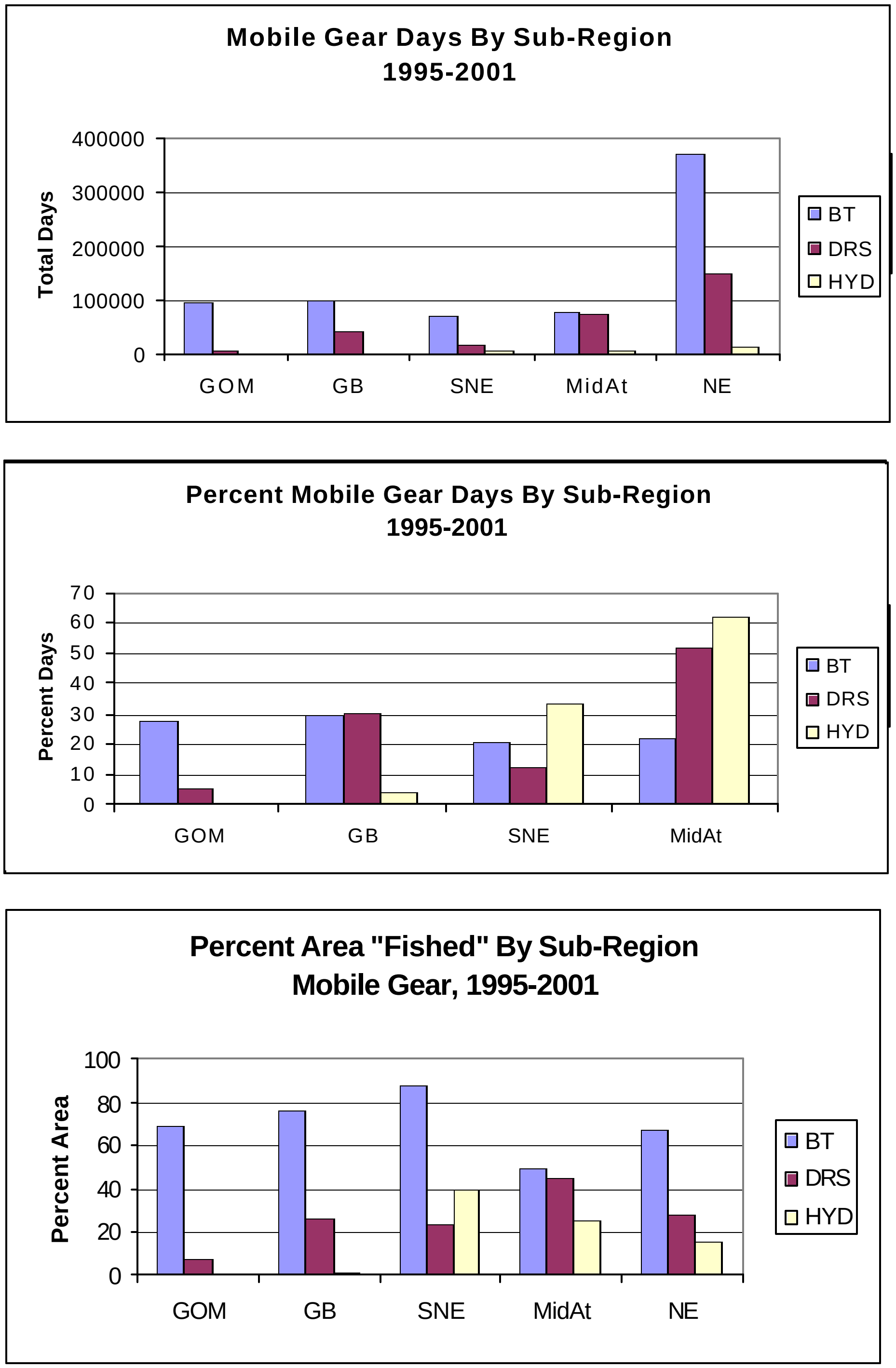


Figure 250 - Total and percent days absent from port or fishing for the three principal mobile gear types used in the Northeast region by sub-region (top two graphs) and percent of total area in each sub-region and in the entire NE region occupied by TMS that account for 90% of the total fishing activity by each gear type (bottom graph).

GOM = Gulf of Maine, GB = Georges Bank, SNE = southern New England, MA = Mid-Atlantic, BT = bottom trawls, DRS = scallop dredges, and HYD = hydraulic clam dredges.

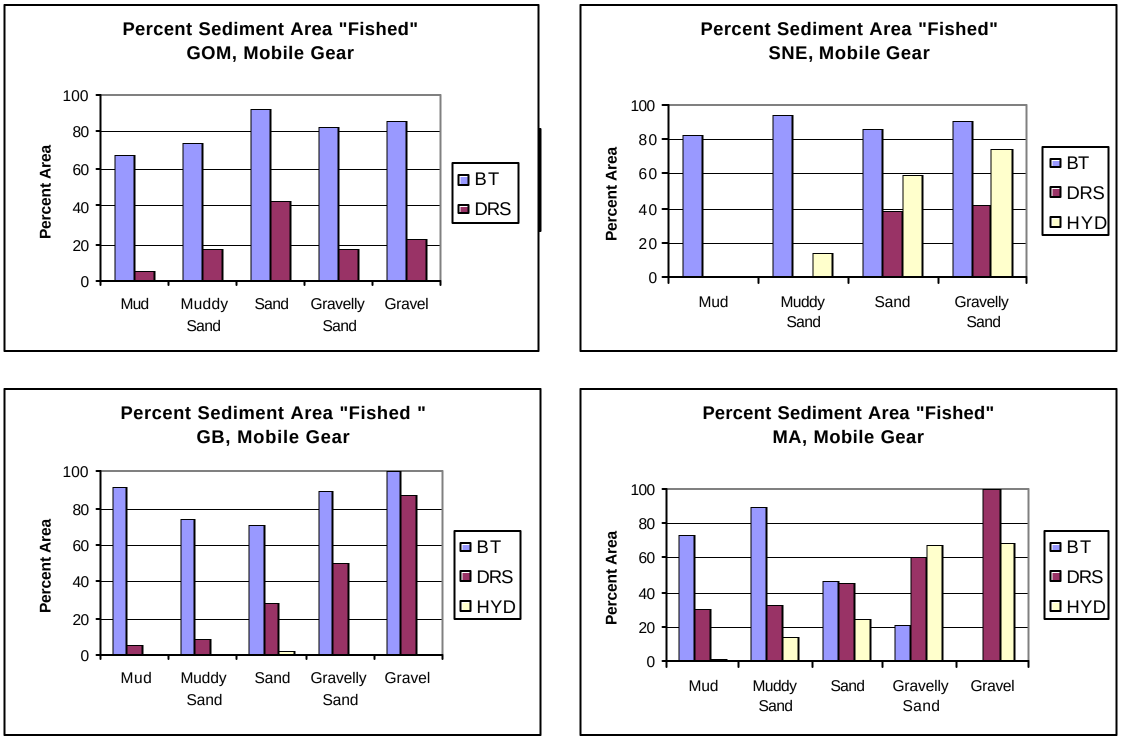


Figure 251 - Relative distribution of fishing activity by sediment type for bottom trawl (BT), scallop dredge (DRS), and hydraulic clam dredge (HYD) vessels as a percentage of the area occupied by TMS that accounted for 90% of the total number of days absent from port or days fishing in four sub-regions of the U.S. NE region.

GOM = Gulf of Maine, GB = Georges Bank, SNE = southern New England, and MA = Mid-Atlantic.

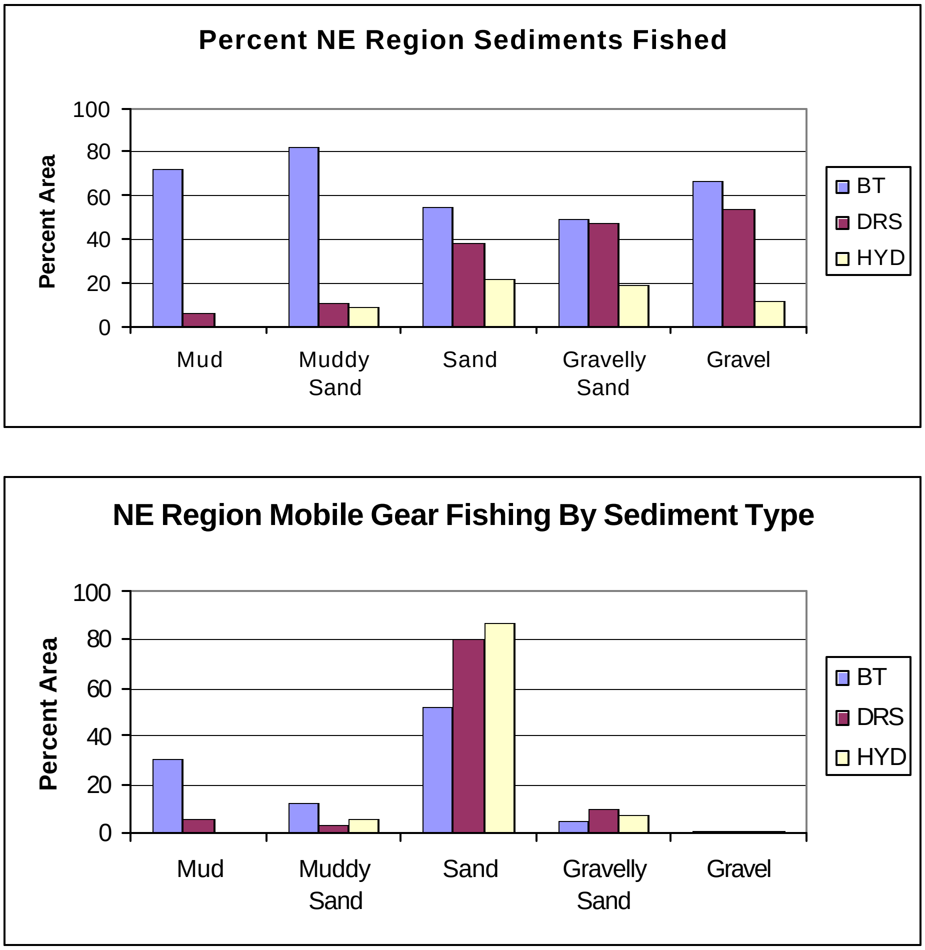


Figure 252 - Percent area by sediment type and percent area of each sediment type present that was included in ten minute squares that accounted for 90% of total fishing activity by bottom trawls, scallop dredges, and hydraulic clam dredges during 1995-2001 in the U.S. Northeast region.

9.3.1.2.4 Types of Gear Effects

9.3.1.2.4.1 Overview of Existing Information

A number of authors have reviewed, to varying extents, existing scientific literature on the effects of fishing on habitat (e.g., Auster et al. 1996, Cappo et al. 1998, Collie 1998, Jennings and Kaiser 1998, Rogers et al. 1998, Auster and Langton 1999, Hall 1999, Collie et al. 2000, Lindeboom and de Groot 2000, Barnette 2001, National Research Council 2002). The following summary of the conclusions reached by these authors is extracted from a recent NOAA report (Johnson 2002).

A number of review papers have focused specifically on the physical effects of bottom trawls. In Europe, an ICES working committee (ICES 1973) concluded that otter trawls, beam trawls and dredges all have similar effects on the seabed, but the magnitude of disturbance increases from shrimp to beam trawls with tickler and stone guards, to Rapido trawls, to mollusc (e.g., scallop) dredges. Kaiser et al. (1996) and Collie et al. (2000) state that, because beam trawls are used almost exclusively in areas that are adapted to frequent wave/tidal action, they are less likely to adversely affect bottom habitats. As mentioned elsewhere in this DEIS, scallop dredges used in Europe and Australia are designed differently than the sweep dredge used in the Northeast region of the U.S. Specifically, they have a row of teeth that penetrate several inches into the bottom and therefore have a greater impact on benthic habitats than the sweep dredge. Beam trawls and Rapido trawls are not used in the U.S. groundfish fishery.

Auster et al. (1996) conducted three studies of mobile fishing gear in the Gulf of Maine and concluded that mobile fishing gear alters the seafloor, and reduces habitat complexity, sedimentary structures, and emergent epifauna. Collie (1998) reviewed studies from New England and concluded that hard bottom benthic habitats (e.g., boulders and gravel pavement) experience significant impacts of mobile bottom-tending fishing gear, while mobile sand habitats are less vulnerable. Jennings and Kaiser (1998) concluded that fishing activities lead to changes in the structure of marine habitats and influence the diversity, composition, biomass, and productivity of the associated biota. They further concluded that these effects vary according to gears used, habitats fished, and the magnitude of natural disturbance, but tend to increase with depth and the stability of the substrate. Auster and Langton (1999) reviewed 22 studies from a wide geographic range and concluded that mobile fishing gear reduces habitat complexity by: (1) directly removing epifauna or damaging epifauna leading to mortality, (2) smoothing sedimentary bedforms and reducing bottom roughness, and (3) removing taxa which produce structure (i.e., taxa which produce burrows and pits). They also concluded that for fixed gear, the area impacted per unit effort is smaller than for mobile gear, but the types of damage to emergent benthos appear to be similar (but not necessarily equivalent per unit effort).

Collie et al. (2000) analyzed 39 published studies to compile and evaluate current findings regarding fishing gear effects on different types of benthic habitat. They found: (1) 89% of the studies were undertaken at depths less than 60 m; (2) otter trawl gear is the most frequently studied; (3) most studies have been done in Northern Europe and Eastern North America. The authors reached several conclusions regarding the effects of fishing: (1) intertidal dredging and scallop dredging have the greatest initial effects on benthic biota, followed by otter trawling and then beam trawling (although beam trawling studies were conducted in dynamic sandy areas, where effects might be less apparent); (2) fauna in stable gravel, mud and biogenic habitats are more adversely affected than those in less consolidated coarse sediments; (3) recovery appears most rapid in less physically stable habitats (inhabited generally by more opportunistic species); (4) we may accurately predict recovery rates for small-bodied taxa, but communities often contain one or two long-lived, vulnerable species; (5) large-bodied organisms are more prevalent before trawling; and (6) the mean initial response to fishing impacts is negative (55% reduction of individual taxa). Based on these findings, the authors suggested that the scientific community abandon short-term small-scale experiments and undertake larger scale experiments that mimic the timing and frequency of disturbance typical of commercial fishing activities.

A working committee of the International Council for the Exploration of the Seas (ICES) issued, in November 2000, a report on the "Effects of Different Types of Fisheries on North Sea and Irish Sea Benthic Ecosystems." This report (ICES 2000) was a summary of findings based on a comprehensive report of the same title edited by Lindeboom and de Groot (1998). The ICES report identified a number of possible effects of beam trawls and bottom otter trawls on benthic habitats and species. Two general conclusions were: 1) low-energy environments are more affected by bottom trawling; and 2) bottom trawling can affect the potential for habitat recovery (i.e., after trawling ceases, benthic communities and habitats may not always return to their original pre-impacted state). Regarding direct habitat effects, the committee concluded that:

<u>Bottom trawls can cause the loss or dispersal of physical features</u> such as peat banks or boulder reefs. These changes are always permanent and lead to an overall change in habitat diversity. This, in turn, can lead to the local loss of species and species assemblages dependant on such features.

<u>Bottom trawling can cause the loss of structure-forming organisms</u> (e.g., colonial bryozoans, Sabellaria, hydroids, seapens, sponges, mussel beds, and oyster beds). These changes may be permanent and can lead to an overall change in habitat diversity. This, in turn, can lead to the local loss of species and species assemblages dependant on such biogenic structures.

<u>Bottom trawling can cause a reduction in complexity</u> by redistributing and mixing surface sediments as well as degrading habitat and biogenic features. This can lead to a decrease in the physical patchiness of the sea floor. These changes are not likely to be permanent.

<u>Bottom trawling can alter the detailed physical structure of the sea floor</u> by reshaping seabed features such as sand ripples and damaging burrows and associated structures. These features provide important habitats for smaller animals and can be used by fish to reduce their energy requirements. These changes are not likely to be permanent.

The committee also identified a number of possible effects of bottom trawling on species.

- Bottom trawling can cause the loss of species from part of their normal range.
- Bottom trawling can cause a decrease in populations which have low rates of turnover.
- The relative abundance of species is altered by bottom trawling.
- Fragile species are more affected by bottom trawling than robust species
- Surface-living species are more affected by bottom trawling than deep-burrowing species.
- Bottom trawling can have sub-lethal effects on individuals.
- Bottom trawling can cause an increase in populations which have high rates of turnover.
- Bottom trawling favors populations of scavenging species.

Direct habitat effects of fishing have also been summarized by Johnson (2002) in four categories: alteration of physical structure, sediment suspension, chemical modifications, and benthic community changes. Most of the effects mentioned below can also be found in the review of the existing gear effects literature that is included in the Gear Effects Evaluation of this SEIS.

Alteration of Physical Structure

Physical effects of fishing gear can include scraping, plowing, burial of mounds, smoothing of sand ripples, removal of stones or dragging and turning of boulders, removal of taxa that produce structure, and removal or shredding of submerged aquatic vegetation (Fonseca et al.1984, Messieh et al. 1991, Black and Parry 1994, Gordon et al. 1998, Kaiser et al. 1998, Lindeboom and de Groot 1998, Schwinghamer et al. 1998, Auster and Langton 1999, Kaiser et al. 1999, Ardizzone et al. 2000). These physical alterations reduce the heterogeneity of the sediment surface, alter the texture of the sediments, and reduce the structure available to biota as habitat. As mobile gear is dragged across the seafloor, parts of some gears can penetrate up to 5-30 cm into the substrate under usual fishing conditions, and likely to greater depths under unusual conditions (Drew and Larsen 1994). This action can leave tracks or even trenches in the seafloor, depending on the sediment type. It is unknown whether or to what extent these human-made features might compensate for the sediment smoothing actions of the gear.

Sediment Suspension

Re-suspension of sediments occurs as fishing gear is dragged along the seafloor. Effects of sediment suspension can include reduction of light available for photosynthetic organisms, burial of benthic biota, smothering of spawning areas, and negative effects on feeding and metabolic rates of organisms. If re-suspension occurs over a large enough area it can actually cause large scale re-distribution of sediments (Messieh et al. 1991, Black and Parry 1994). Re-suspension may also have important implications for nutrient budgets due to burial of fresh organic matter and exposure of deep anaerobic sediment, upward flux of dissolved nutrients in porewater, and change in metabolism of benthic infauna (Mayer et al. 1991, Pilskaln et al. 1998).

Effects of sediment re-suspension are site-specific and depend on sediment grain size and type, water depth, hydrological conditions, faunal influences, and water mass size and configuration (Hayes et al. 1984, LaSalle 1990, Barnes et al. 1991, Coen 1995). Effects are likely more significant in waters that are normally clear compared with areas that are already highly perturbed by physical forces (Kaiser 2000). Schoellhamer (1996) concluded that re-suspension by natural mechanisms in a shallow estuary in west-central Florida was less frequent and of smaller magnitude than anthropogenic mechanisms (e.g., fishing) and that sediments disturbed by fishing were more susceptible to re-suspension by tidal currents. Modeling by Churchill (1989) revealed that re-suspension by trawling is the primary source of suspended sediment over the outer continental shelf of the eastern U.S., where storm-related stresses are weak. In the Kattegat Sea (Sweden), sandy sediments above the halocline were more affected by wind-induced impacts than by fishing, but mud sediments below the halocline experienced an increase in frequency of 90% in the spring and summer and of 75-85% in the autumn and winter due to fishing (Floderus and Pihl 1990). Thus, even when recovery times are fast, persistent disturbance by fishing could lead to cumulative impacts. In contrast, Dyekjaer et al. (1995) found that in Denmark, although local effects of short duration might occur, annual release of suspended particles by mobile fishing gear is relatively unimportant compared with that resulting from wind and land runoff.

Chronic suspension of sediments and resulting turbidity can also affect aquatic organisms through behavioral, sublethal and lethal effects, depending on exposure. Species reaction to turbidity depends on life history characteristics of the species. Mobile organisms can move out of the affected area and quickly return once the disturbance dissipates (Simenstad 1990, Coen 1995). Even if species experience high mortality within the affected area, species with short life history stages and high levels of recruitment or high mobility can repopulate the affected area quickly. However, if effects are protracted and occur over a large area, recovery through recruitment or immigration will be hampered. Furthermore, chronic re-suspension of sediments may lead to shifts in species composition by favoring those species that are better suited to recover or those that can take advantage of the pulsed nutrient supply as nutrients are released from the seafloor to the euphotic zone (Churchill 1989).

Changes in Chemistry
Fishing can produce changes to the chemical makeup of both the sediments and overlying water mass through mixing of subsurface sediments and porewater. In shallow water this mixing might be insignificant in relation to that produced by tidal and storm surge and wave action, but in deeper, more stable waters, this mixing can have significant effects (Rumohr 1998). In a shallow, eutrophic sound in the North Sea, fishing caused an increase in average ammonia content (although horizontal variations prevented interpretations of these increases) and a decrease in oxygen due to the mixing of reduced particles from within the sediments (Riemann and Hoffman 1991). Also in the North Sea, fishing enhances the phosphate released from sediment by 70-380 metric tons per year for otter trawls and by 10,000-70,000 metric tons per year for beam trawlers (ICES 1992). These pulses are partially compensated by lower fluxes after the trawl passes. It is important to remember that these releases recycle existing nutrients, rather than adding new nutrients, such as nutrients derived from rivers and land runoff (ICES 1992). During seasons when nutrients are low, mixing of the sediments could cause increased primary production and/or eutrophication.

Changes to Benthic Communities
Benthic communities are affected by fishing gear through damage to the benthos in the path of the gear and disturbance of the seafloor to a depth of up to 30 cm. Many kinds of epibenthic animals are crushed or buried, while infauna is excavated and exposed on the seabed. This is in addition to smothering addressed above.

Specific impacts from fishing depend on the life history, ecology and physical characteristics of the biota present (Bergman and Van Santbrink 2000). Mobile species that exhibit high fecundities and rapid generation times will recover more quickly than non-mobile, slow-growing organisms. In Mission Bay, California, polychaetes with reduced larval phases and postlarval movements had small-scale dispersal abilities that permitted rapid re-colonization of disturbed patches that maintained high infaunal densities (Levin 1984). Those with long-lived larvae were only available for successful re-colonization if the timing of disturbance coincided with periods of peak larval abundance; however, these species were able to colonize over much larger distances. Rijnsdorp and Van Leeuwen (1996) found that increased growth in the smallest size classes of plaice in the North Sea correlated to eutrophication and seabed disturbance caused by beam trawls. The authors hypothesized that trawling caused a shift in the benthic community from low-productive, long-lived species to high-productive, short-lived species that benefited from increased nutrient availability. This potentially could have led to increased prey availability, and thus, higher growth rates for the juvenile plaice.

The physical structure of biota also affects their ability to sustain and recover from physical impacts with fishing gear. Thin shelled bivalves and starfish show higher damage than solid-shelled bivalves in fished areas (Rumohr and Krost 1991). Animals that are able to retract below the surface of the seafloor or live below the penetration depth of the fishing gear will sustain much less damage than epibenthic organisms that inhabit the sediment surface. Animals that are more elastic and can bend upon contact with fishing gear will suffer much less damage than those that are hard and inflexible (Eno et al. 2001). Kaiser et al. (2000) found that chronic fishing around the Isle of Man, in the Irish Sea, has removed large-bodied fauna such that benthic communities are now dominated by smaller-bodied organisms that are less susceptible to physical disturbance. Off the northwest shelf of Australia, a switch of dominant fish species from lethrinids and lutjanids (which are almost exclusively associated with habitats supporting large epibenthos) to saurids and nemipterids (which were found on open sand) occurred after removal of epibenthic fauna by trawling (Sainsbury et al. 1993, 1994) has been documented.

Increased fishing pressure can also lead to changes in distribution of species, either through movement of animals away from or towards the fished area (Kaiser and Spencer 1993, 1996, Ramsay et al. 1996, Kaiser and Ramsay 1997, Ramsay et al. 1998, Bradshaw et al. 2000, Demestre et al. 2000). Frid and Hall

(1999) found higher prevalence of fish remains and scavengers and a lower abundance of sedentary polychaetes in stomach contents of dabs in the North Sea in areas of higher fishing effort. Kaiser and Spencer (1994) document that gurnards and whiting aggregate over beam trawl tracks and have higher numbers of prey items in their stomachs shortly after trawling. Based on these studies, researchers have speculated that mobile fishing may lead to increased populations of species that exhibit opportunistic feeding behavior. Fonds and Groenewold (2000) modeled results for the southern North Sea indicating that the annual amount of food supplied by beam trawling is approximately 7% of the food demand of common benthic predators. This level could help maintain populations but is insufficient to support further population growth.

The most recent and comprehensive summary of gear effects on benthic marine habitats was prepared by the National Research Council. This report, entitled "Effects of Trawling and Dredging on Seafloor Habitat" (NRC 2002) reiterated four general conclusions regarding the types of habitat modifications caused by trawls and dredges.

- Trawling and dredging reduce habitat complexity.
- Repeated trawling and dredging result in discernable changes in benthic communities.
- Bottom trawling reduces the productivity of benthic habitats.
- Fauna that live in low natural disturbance regimes are generally more vulnerable to fishing gear disturbance.

The NRC report also summarized the indirect effects of mobile gear fishing on marine ecosystems. It did not consider the effects of all gear types, only the two (trawls and dredges) that are considered to most affect benthic habitats. It also provided detailed information from only a few individual studies.
An additional source of information used in this DEIS is the report of a gear effects workshop sponsored by the New England and Mid-Atlantic Fishery Management Councils in October 2001 (NREFHSC 2002). This report includes conclusions reached by a panel of experts on the effect of different gears on benthic habitat types in the Northeast U.S. and is appended to this document (Appendix IV). Refer to the following tables in that report for conclusions on these gear types: Clam Dredges, Scallop Dredges, Otter Trawls, Pots and Traps, and Sink Gill Nets and Bottom Longlines. The results of the workshop have been considered in the next section, which includes a review of the relevant fishing gear effects literature.

9.3.1.2.4.2 Review of Fishing Gear Effects Literature Relevant to the U.S. Northeast Region

Forty-four publications were reviewed for this document. They included all known studies (written in English) that examined the effects of the three principal mobile, bottom-tending fishing gears used in the Northeast U.S. on benthic marine habitats. Only publications that evaluated the direct habitat effects of fishing by these gears were reviewed (i.e., modifications to the physical structure of the seafloor or effects on benthic organisms that live in or on the seafloor). Effects of fishing on resource populations were not included, nor were studies that evaluated the indirect effects of fishing on marine ecosystems caused by the selective removal of species targeted by the gear or which are caught incidentally (as by-catch) during fishing.

Both peer-reviewed and non-peer-reviewed publications were included, but most were peer-reviewed. To be included, accounts of research projects had to be complete and describe methods and results. Abstracts and poster presentations were not included. The summaries in this document are, in all cases, based on primary source documents. Two bottom-tending mobile gear types that are widely used in other parts of the world, but not in the Northeast U.S. – beam trawls and toothed scallop dredges – were not included even though considerable research has been conducted on their habitat effects. Also excluded were studies done on the effects of other gear types used strictly in inshore state waters in habitats where sea scallops are not found (e.g., escalator dredges in submerged aquatic vegetation) and any research relating to fixed and pelagic gear effects. Fixed bottom gears used in the Northeast region (e.g., lobster pots, bottom longlines and gill nets) have minimal impacts on benthic habitats (Eno et al. 2001, NREFHSC 2002).

The review is organized by gear and substrate type. The four substrate types were mud, sand, gravel/rock, and mixed substrate for studies that were conducted in more than a single sediment type. Nine of the 44 studies that were reviewed included information for more than one gear type or for one gear type in more than one substrate or study area and were therefore summarized in more than a single gear/substrate category. Thirty of the 53 individual research accounts were for bottom otter trawls, six were for scallop dredges, and seven for hydraulic dredges. In addition, ten addressed the combined effects of more than one gear type and are referred to as “multiple gears.” Twenty-four of the studies were done in sandy substrate, 11 in mud, 5 in gravel and rocky bottom, and 13 in mixed substrate. Geographically, 18 were conducted in the Northeast U.S. (North Carolina to Maine), 13 elsewhere in North America (U.S. and Canada), 16 in Europe and Scandinavia, and 6 in Australia and New Zealand.

Each gear/substrate category includes a table summarizing the main points of each study. These include the location, depth, sediment, results, recovery information, and methodological approach of each study. Results summarized in the tables include positive and negative results, e.g., increases and decreases in abundance of non-resource benthic organisms caused by fishing, as well as instances when there were no detectable effects of fishing. Blank cells in the recovery column indicate that the study was not designed to provide information on recovery times. Information in the last column includes the nature of the research (experimental or observational), whether or not the study area was being commercially fished at the time of the study, and how the experimental fishing was conducted (single or multiple tows, discrete or repeated disturbance events, and – if known – the average number of tows to which any given area of bottom was exposed).

Results are summarized for all the studies in each gear-substrate category. Each summary begins with an introductory paragraph that includes general information, such as:

- The number of studies that examined physical and biological effects;
- How many studies were done in different geographic areas and depth ranges;
- How many examined recovery of affected habitat features;
- The number of studies performed in areas that were closed to commercial fishing vs. areas that were commercially fished at the time of the study;
- How many involved single vs. multiple tows; and
- How many were conducted either during a single, discrete time period or during a more prolonged period of time that was intended to simulate actual commercial fishing activity.

Physical and biological effects for each gear-substrate category are then summarized in separate paragraphs. When necessary, biological effects are presented separately for single disturbance and repeated disturbance experimental studies, and for observational studies.

9.3.1.2.4.2.1 OTTER TRAWLS

9.3.1.2.4.2.1.1 Otter Trawls – Mud

Results of 11 studies are summarized (Table 395). All of them were conducted during the last 11 years, five in North America, four in Europe, and one in Australia. One was performed in an inter-tidal habitat, one in very deep water (250 m), and the rest in a depth range of 14-90 meters. Seven of them were experimental studies, three were observational, and one was both. Two examined physical effects, six of them assessed biological effects, and three studies examined physical and biological effects. One study evaluated geochemical sediment effects. In this habitat type, biological evaluations focused on infauna: all nine biological assessments examined infaunal organisms and four of them also included epifauna. Habitat recovery was monitored on five occasions. Two studies evaluated the long-term effects of commercial trawling, one by comparing benthic samples from a fishing ground with samples collected near a shipwreck, while another evaluated changes in macrofaunal abundance during periods of low, moderate, and high fishing effort during a 27-year time period. Four of the experimental studies were done in closed or previously un-trawled areas and three in commercially fished areas. One study examined the effects of a single tow and six involved multiple tows, five restricted trawling to a single event (e.g., one day) and two examined the cumulative effects of continuous disturbance.

Physical Effects

Note that citations are numbered and refer to the references listed in Table 395.

Trawl doors produce furrows up to 10 cm deep and berms 10-20 cm high on mud bottom. Evidence from four studies (2,3,7,9) indicates that there is a large variation in the duration of these features (2-18 months). There is also evidence that repeated tows increase bottom roughness (11), fine surface sediments are re-suspended and dispersed (7), and rollers compress sediment (2). A single pass of a trawl did not cause sediments to be turned over (7), but single and multiple tows smoothed surface features (4,7).

Biological Effects

Single disturbance experimental studies

Two single-event studies (2,9) were conducted in commercially trawled areas. Experimental trawling in intertidal mud habitat in the Bay of Fundy (Canada) disrupted diatom mats and reduced the abundance of nematodes in trawl door furrows, but recovery was complete after 1-3 months (2). There were no effects on infaunal polychaetes. In a sub-tidal mud habitat (30-40 m deep), benthic infauna were not affected (9). In two assessments performed in areas that had not been affected by mobile bottom gear for many years (4,10), effects were more severe. In both cases, total infaunal abundance and the abundance of individual polychaete and bivalve species declined immediately after trawling (4,10). In one of these studies (10), there were also immediate and significant reductions in the number of species and species diversity. Positive effects included reduced porosity, increased food value, and increased chlorophyll production in surface sediments. Most of these effects lasted less than 3.5 months. In the other (4), two tows removed 28% of the epifauna on mud and sand substrate and epifauna in all trawled quadrats showed signs of damage. These results were not reported separately for mud bottom.

Repeated disturbance experimental studies

Two studies of the effects of repeated trawling were conducted in areas that had been closed to fishing for six years and >25 years. In one (6), multiple tows were made weekly for a year and, in the other (11), monthly for 16 months. In one case, 61% of the benthic species sampled tended to be negatively affected, but significant reductions were only noted for brittlestars (6). In the other, repeated trawling had no significant effect on the numbers of infaunal individuals or biomass (11). In this study, the number of infaunal species increased by the end of the disturbance period. Some species (e.g., polychaetes) increased in abundance, while others (e.g., bivalves) decreased. Community structure was altered after five months of trawling and did not fully recover until 18 months after trawling ended.

Observational studies

An analysis of benthic sample data collected from a fishing ground over a 27-year period of high, medium, and low levels of fishing effort showed an increased abundance of organisms belonging to taxa that were expected to increase at higher disturbance levels, whereas those that were expected to decrease did not change in abundance (5). Results of another study indicated that a trawling ground had fewer benthic organisms and fewer species than an un-exploited site near a shipwreck (1). Trawling in deep water apparently dislodged infaunal polychaetes, causing them to be suspended in near-bottom water (8).

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Ball et al. 2000	Irish Sea	75 m	Sandy silt	Reduced infaunal and epifaunal richness, diversity, number of species and individuals in fishing ground compared to wreck site.		Experimental trawling in heavily fished prawn fishing ground, unfished area near a shipwreck used as control.
2	Brylinsky et al. 1994	Bay of Fundy, , Nova Scotia, Canada	Inter-tidal	Silt and coarse sand overlain with silty layer	Door tracks in sediment, rollers compressed sediment; S decrease in nematodes and benthic diatoms in door tracks, no effects on larger infaunal organisms (mostly polychaetes).	Furrows visible 2-7 months; nematodes recovered in 1-1.5 mos, diatoms in about 1-3 mos.	Four trawling experiments (repeated tows during a single day) at two locations in a trawled area, effects evaluated for 1.5-4 mos.
3	DeAlteris et al. 1999	Narragansett Bay, Rhode Island, USA	14 m	Mud	Doors produced tracks 5-10 cm deep and adjacent berm 10-20 cm high.	No changes in hand dug trenches for > 60 days.	Diver observations
4	Drabsch et al. 2001	Gulf of St. Vincent, South Australia	20 m	Fine silt	Trawl door tracks, smoothing of topographic features, S decrease in total infaunal abundance and one group of polychaetes, damaged epifauna.		Experimental trawling (2 tows per unit area in 1 day) in area with no trawling for 15 years (1 site), effects evaluated after 1 week.

Table 395 - Effects of Otter Trawls on Mud Substrate Habitat: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
5	Frid et al. 1999	NE England (North Sea)	80 m	Silt/clay	S increase in total number of individuals in taxa predicted to increase at high fishing effort and number of errant polychaetes, no effect of increasing effort on total number of individuals expected to decrease, but S decline in sea urchins.		Related changes in benthic fauna in a heavily trawled location to low, high, and moderate fishing activity and changes in phytoplankton production over 27 yrs.
6	Hansson et al. 2000	Fjord on the west coast of Sweden	75-90 m	Clay	61% infaunal species negatively affected and S reductions in brittlestars during last 6 mos of disturbance period, S reductions in total biomass and number of individuals in trawled and control sites, abundance of polychaetes, amphipods and molluscs not affected.		Experimental trawling for 1 year (2 tows per wk, 24 tows per unit area) in area closed to fishing for 6 yrs (3 treatment and 3 control sites), effects evaluated during last 5 mos of experiment.
7	Mayer et al. 1991	Maine coast, USA	20 m	Mud	Dispersal of fine surface sediment, doors made furrows several cm deep, some planing of surface features, but no plowing of bottom or burial of surface sediments.		Experimental trawling (single tow), examined immediate effects on sediment composition and food value to sediment depth of 18 cm.

Table 395 - Effects of Otter Trawls on Mud Substrate Habitat: Summary of Published Studies(cont.)

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
8	Pilskaln et al. 1998	Gulf of Maine (USA)	250 m	Mud	Greater abundance of suspended infaunal polychaetes in more heavily-trawled area.		Deployed sediment traps in fishing grounds 25-35 m above substrate.
9	Sanchez et al. 2000	Coast of Spain, Mediterranean Sea	30-40 m	Mud	Door tracks in sediment, no change in number of infaunal individuals or taxa or abundance of individual taxa, no changes in community structure.	Door tracks still clearly visible after 150 hrs.	Experimental trawling in trawled area at 2 sites swept once and twice in a single day, effects evaluated after 24, 72, 102, and 150 hrs.
10	Sparks-McConkey & Watling 2001	Penobscot Bay, Maine (USA)	60 m	Mud	S decline in porosity, increased food value, and increased chlorophyll production of surface sediments, S reductions in number of infaunal individuals and species, species diversity, and abundances of 6 polychaete and bivalve species, S increase in nemerteans.	All geochemical sediment properties and all but one polychaete/bivalve species recovered within 3.5 mos, nemerteans still more abundant after 5 mos.	Experimental trawling (4 tows in 1 day) in untrawled area, pre-trawl sampling of sediments and infauna for a year, recovery monitored for 5 mos.

Table 395 - Effects of Otter Trawls on Mud Substrate Habitat: Summary of Published Studies(cont.)

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
11	Tuck et al. 1998	West coast of Scotland	30-35 m	Fine silt	Tracks in sediment, increased bottom roughness, no effect on sediment characteristics; S increase in number of infaunal species after 16 mos and during 18 mo recovery period, no change in biomass or number of individuals; S increase in polychaetes, decrease in bivalves; S alteration in community structure after 5 mos, S reduction in diversity during first 22 mos.	Door tracks still evident after 18 months, bottom roughness recovered after 6 mos; nearly complete recovery of infaunal community within 12 mos, complete after 18 mos	Experimental trawling for 1 day/mo (1.5 tows per unit area) for 16 mos in area closed to fishing for >25 years, recovery monitored after 6, 12, and 18 mos

Table 395 - Effects of Otter Trawls on Mud Substrate Habitat: Summary of Published Studies(cont.)

9.3.1.2.4.2.1.2 Otter Trawls – Sand

Results of 14 studies are summarized (Table 396). One of them was described in a 1980 publication, all the rest have been published since 1998. Six studies were conducted in North America (three in a single long-term experiment on the Grand Banks), four in Australia, and four in Europe. Ten are experimental studies. Eight of them were done in depths less than 60 m, one at 80 m, and four in depths greater than 100 m. Three studies examined the physical effects of trawling, ten were limited to biological effects, and one examined both. Five of the biological studies were restricted to epifauna, one only examined infauna, and five included epifauna and infauna. The only experiment that was designed to monitor recovery was the one on the Grand Banks, although surveys conducted in Australia documented changes in the abundance of benthic organisms five years after closed areas were established. Two studies compared benthic communities in trawled areas of sandy substrate with undisturbed areas near a shipwreck. Six studies were performed in commercially exploited areas, five in closed areas, two compared closed and open areas, and one was done in a test tank. All the experimental studies examined the effects of multiple tows (up to 6 per unit area of bottom) and observational studies in Australia assessed the effects of 1-4 tows on emergent epifauna. Trawling in four studies was limited to a single event (1 day to 1 week), whereas the Grand Banks experiment was designed to evaluate the immediate and cumulative effects of annual 5-day trawling events in a closed area over a three-year period.

Physical effects

A test tank experiment showed that trawl doors produce furrows in sandy bottom that are 2 cm deep, with a berm 5.5 cm high (7). In sandy substrate, trawls smoothed seafloor topographic features (4,14), re-suspended and dispersed finer surface sediment (7), but had no lasting effects on sediment composition (14). Trawl door tracks lasted up to one year in deep water (14), but only for a few days in shallow water (3). Seafloor topography recovered within a year (14).

Biological effects

Single disturbance experimental studies

Two single-event studies (2,6) were conducted in commercially trawled areas. In one of these studies (2), otter trawling caused high mortalities of large sedentary and/or immobile epifaunal species. In the other (6), there were no effects on benthic community diversity. Neither of these studies investigated effects on total abundance or biomass. Two studies were performed in un-exploited areas. One study documented effects on attached epifauna. In one (11), single tows reduced the density of attached macrobenthos (>20 cm) by 15% and four tows by 50%. In the other (4), two tows removed 28% of the epifauna on mud and sand substrate and epifauna in all trawled quadrats showed signs of damage. These results were not reported separately for sand bottom. Total infaunal abundance was not affected, but the abundance of one family of polychaetes was reduced.

Repeated disturbance experimental studies

Intensive experimental trawling on the Grand Banks reduced the total abundance and biomass of epibenthic organisms and the biomass and average size of a number of epibenthic species (12). Significant reductions in total infaunal abundance and the abundance of 15 taxa (mostly polychaetes) were detected during only one of three years, and there were no effects on biomass or taxonomic diversity (9).

Observational studies

Changes in macrofaunal abundance in a lightly trawled location in the North Sea were not correlated with historical changes in fishing effort (5), but there were fewer benthic organisms and species in a trawling ground in the Irish Sea than in an un-exploited site near a shipwreck (1). In the other "shipwreck study," however, changes in infaunal community structure at increasing distances from the wreck were related to changes in sediment grain size and organic carbon content (8). The Alaska study (10) showed that epifauna attached to sand were less abundant inside a closed area, significantly so for sponges and anemones. A single tow in a closed area in Australia removed 89% of the large sponges in the trawl path (13).

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Ball et al. 2000	Irish Sea	35 m	Muddy sand	Lower number of infaunal and epifaunal species and individuals, species diversity and richness compared to wreck site.		Experimental trawling in heavily fished prawn fishing ground, unfished area near a shipwreck used as control.
2	Bergman and Santbrink 2000	Southern North Sea (Dutch coast)	<30-50 m	Silty sand and sand	High (20-50%) mortalities for 6 sedentary and/or immobile megafaunal (>1 cm) species, <20% for 10 others, from a single pass of the trawl, S effects on 11 of 54 occasions.		Experimental trawling (1.5 tows per unit area) in commercially trawled area, effects assessed after 24-48 hrs.
3	DeAlteris et al. 1999	Narragansett Bay, Rhode Island (USA)	7 m	Sand	No tracks.	Hand dug trenches not visible after 1-4 days.	Diver observations.
4	Drabsch et al. 2001	Gulf of St. Vincent, South Australia	20 m	Coarse sand with shells.	Trawl door tracks, smoothing of topographic features, removal of and damage to epifauna, no S effects on total infaunal abundance, S reduction in density for one family of polychaetes after 1 week.		Experimental trawling (2 tows per unit area) in area with no trawling for 15 years, effects assessed after 1 week (site 1) and 3 mos (site 2).

Table 396 - Effects of Otter Trawls on Sand Substrate Habitat: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
5	Frid et al. 1999	NE England (North Sea)	55 m	Sand	Total abundance of benthic macrofauna increased as phytoplankton abundance increased, no correlation with fishing effort.		Related changes in benthic fauna in a lightly trawled location to low, high, and moderate fishing activity and changes in phytoplankton production over 27 yrs.
6	Gibbs et al. 1980	Botany Bay, New South Wales, Australia	Shallow estuary	Sand with 0-30% silt/clay	Sediment plume, no consistent effects on benthic community diversity, very little disturbance of seafloor.		Sampling before, immediately after, and 6 mos after 1 week of experimental trawling in fished location, control area located 200 km away.
7	Gilkinson et al. 1998	Test tank to simulate Grand Banks of Newfoundland		Sand	Trawl door created 5.5 cm berm adjacent to 2 cm furrow, bivalves displaced.		Observed effects of commercial otter door model in test tank.
8	Hall et al. 1993	North Sea	80 m	Coarse sand	Abundance of infauna related to changes in sediment type and organic content, not distance from shipwreck.		Sampled infauna at increasing distance from a shipwreck (proxy for increasing fishing effort).

Table 396 - Effects of Otter Trawls on Sand Substrate Habitat: Summary of Published Studies(cont.)

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
9	Kenchington et al. 2001	Grand Banks, Newfoundland	120-146 m	Fine to medium grain sand	S short-term reductions in total abundance and abundance of 15 infaunal taxa (mostly polychaetes) in only 1 of 3 years , no short-term effects on biomass or taxonomic diversity, no long-term effects.	Infaunal organisms that were reduced in abundance in 1994 had recovered a year later.	Experimental trawling (3-6 tows per unit area) in closed area 1, 2 and 3 years after closure, lightly exploited for >10 yrs, effects evaluated within several hrs or days after trawling and after one year.
10	McConnaughey et al. 2000	Eastern Bering Sea, Alaska	44-52 m	Sand with ripples	Reduced abundance (S for sponges and anemones), more patchy distribution, and S decrease in species diversity of sedentary epifauna, mixed responses of motile taxa and bivalves.		Compared abundance of epifauna caught in small-mesh trawl inside and outside an area closed to trawling for almost 40 years.
11	Moran & Stephenson 2000	Northwest Australia	50-55 m	Not given, presumed to be sand	Single tow reduced density of macrobenthos (>20 cm) by 15%, 4 tows by 50%.		Video surveys before and after 4 experimental trawling events (1 tow per unit area) at 2-day intervals in unexploited area.

Table 396 - Effects of Otter Trawls on Sand Substrate Habitat: Summary of Published Studies(cont.)

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
12	Prena et al. 1999	Grand Banks, Newfoundland	120-146 m	Fine to medium grain sand	24% average decrease in epibenthic biomass, S reductions in total and mean individual epifaunal biomass and biomass of 5 of 9 dominant species, damage to echinoderms.		Experimental trawling (3-6 tows per unit area) in closed area 1, 2 and 3 years after closure, lightly exploited for >10 yrs.
13	Sainsbury 1997	Northwest Australia	< 200 m	Calcareous sands	Decreased abundance of benthic organisms and fish associated with large epifauna, removal of attached epifauna (single tow removed 89% of sponges >15 cm).	Increased catch rates of fish associated with large epifauna and small (<25 cm) benthos within 5 yrs, recovery of large epifauna takes >5 yrs.	Compared historical survey data (before and after fishing started) to data collected in area that remained open to commercial trawlers and area closed for 5 years.
14	Schwinghamer et al. 1998	Grand Banks, Newfoundland	120-146 m	Fine and medium grain sand	Tracks in sediment, increased bottom roughness, sediment re-suspension and dispersal, smoothing of seafloor and removal of flocculated organic material, organisms and shells organized into linear features.	Tracks last up to 1 year, recovery of seafloor topography within 1 year.	Experimental trawling (3-6 tows per unit area) in closed area 1, 2 and 3 years after closure, lightly exploited for >10 yrs.

Table 396 - Effects of Otter Trawls on Sand Substrate Habitat: Summary of Published Studies(cont.)

9.3.1.2.4.2.1.3 Otter Trawls – Gravel/Rocky Substrate

Three studies of otter trawl effects on gravel and rocky substrates are summarized in this report (Table 397). All three were conducted in North America. Two were done in glacially-affected areas in depths of about 100 to 300 meters using submersibles and the third was done in a shallow coastal area in the southeast U.S. One involved observations made in a gravel/boulder habitat in two different years before and after trawling affected the bottom. The other two were experimental studies of the effects of single trawl tows. One of these was done in a relatively un-exploited gravel habitat and the other on a smooth rock substrate in an area not affected by trawling. Two studies examined effects to the seafloor and on attached epifauna and one only examined effects on epifauna. There were no assessments of effects on infauna. Recovery was evaluated in one case for a year.

Physical effects

Trawling displaced boulders and removed mud covering boulders and rocks (1) and rubber tire ground gear left furrows 1-8 cm deep in less compact gravel sediment (2).

Biological effects

Trawling in gravel and rocky substrate reduced the abundance of attached benthic organisms (e.g., sponges, anemones, and soft corals) and their associated epifauna (1,2,3) and damaged sponges, soft corals, and brittle stars (2,3). Sponges were more severely damaged by a single pass of a trawl than soft corals, but 12 months after trawling all affected species – including one species of stony coral – had fully recovered to their original abundance and there were no signs of damage (3).

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Auster et al. 1996	Gulf of Maine (Jeffreys Bank)	94 m	Gravel/boulder with thin mud veneer.	Gravel base exposed, boulders moved, reduced abundance of erect sponges and associated epifaunal species.		Submersible and video observations in same location in 1987 and 1993, changes attributed to trawling.
2	Freese et al. 1999	Gulf of Alaska	206-274 m	93% pebble, 5% cobble, 2% boulder.	Boulders displaced, groundgear left furrows 1-8 cm deep in less compact sediment, layer of silt removed, S reductions in abundance of sponges, anemones, and sea whips, damage to sponges, sea whips and brittle stars.		Video observations from a submersible 2-5 hr after single trawl tows in area exposed to little or no commercial trawling for about 20 years.

Table 397 - Effects of Otter Trawls on Gravel/Rock Substrate Habitat: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
3	Van Dolah et al. 1987	Georgia, SE U.S. coast	20 m	Smooth rock with thin layer of sand and attached epifauna.	Reduced abundance of and damage to large sponges and soft corals, esp barrel sponges and stick corals; no S effects on abundance of vase/finger sponges, or stony corals.	Full recovery of damaged organisms and abundance within 12 mos.	Experimental study using diver counts of large sponges and corals before, immediately after, and 12 mos after a single trawl tow in an un-exploited area.

Table 397 - Effects of Otter Trawls on Gravel/Rock Substrate Habitat: Summary of Published Studies

9.3.1.2.4.2.1.4 Otter Trawls – Mixed Substrates

Three studies of the effects of otter trawls on mixed substrates are summarized (Table 398). All three were conducted in North America and relied on sonar and observations made by divers or from a submersible. One of them (2) combined submersible observations and benthic sampling to compare the physical and biological effects of trawling in a lightly fished and heavily fished location in California with the same depth and variety of sediment types. One was a survey of seafloor features produced by trawls in a variety of bottom types (1) and the other primarily examined the physical effects of single trawl tows on sand and mud bottom (3).

Physical effects

Trawl doors left tracks in sediments that ranged from less than 5 cm deep in sand to 15 cm deep in mud (1,3). In mud, fainter marks were also made between the door tracks, presumably by the footgear (1). A heavily trawled area had fewer rocks, shell fragments, and biogenic mounds than a lightly trawled area (2).

Biological effects

The heavily trawled area in California had lower densities of large epifaunal species (e.g., sea slugs, sea pens, starfish, and anemones) and higher densities of brittle stars and infaunal nematodes, oligochaetes, and one species of polychaete (2). There were no differences in the abundance of molluscs, crustaceans, or nemerteans between the two areas. However, since this was not a controlled experiment, these differences could not be attributed to trawling. Single trawl tows in Long Island Sound attracted predators and suspended epibenthic organisms into the water column (3).

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Canadian DFO 1993	Bras d'Or Lakes, Nova Scotia (Canada)	10-500 m	Mud, sand, gravel, and boulders	Trawl doors left parallel marks (furrows and berms), fainter marks from footgear, primarily in mud.		Side scan sonar survey after area was closed to mobile gear for 1 yr.
2	Engel and Kvitek 1998	California (USA)	180 m	Gravel, sand, silt, and clay	S fewer rocks, shell fragments, rocks and mounds in HT area; lower densities of large epibenthic taxa in HT area (S for seapens, seastars, anemones, and sea slugs), higher densities of nematodes, oligochaetes, brittlestars and one species of polychaete in HT area, no differences between areas for crustaceans, molluscs, or nemerteans.		Used a submersible and grab samples (3 yrs) to compare lightly trawled (LT) and heavily trawled (HT) commercial fishing sites with same sediments and depth.
3	Smith et al. 1985	Long Island Sound, New York (USA)	Not given	Sand and mud	Tracks in sediment (<5 cm in sand, 5-15 cm in mud), attraction of predators, suspension of epibenthic organisms.	Tracks "naturalized" by tidal currents.	Video and diver observations.

Table 398 - Effects of Otter Trawls on Mixed Substrate Habitat: Summary of Published Studies
S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

9.3.1.2.4.2.2 NEW BEDFORD SCALLOP DREDGES

9.3.1.2.4.2.2.1 New Bedford Scallop Dredges – Sand

Three studies of the effects of New Bedford scallop dredges on sand substrate are summarized, all performed since 1990 (Table 399). One was conducted in an estuary on the Maine coast (3) and two on offshore banks in the Gulf of Maine (1,2). Two of them were observational in nature, but did not include any direct observations of dredge effects. The other one was a controlled experiment conducted in an unexploited area in which a single dredge was towed repeatedly over the same area of bottom during a single day. One study examined physical effects and two examined physical and biological effects. One of them included an analysis of geochemical effects to disturbed silty-sand sediments.

Physical effects

Dredging disturbed physical and biogenic benthic features (sand ripples and waves, shell deposits [1], and amphipod tube mats [2]), caused the loss of fine surficial sediment (3), and reduced the food quality of the remaining sediment (3). Sediment composition was still altered six months after dredging, but the food quality of the sediment had recovered by then.

Biological effects

There were significant reductions in the total number of infaunal individuals in the estuarine location immediately after dredging and reduced abundances of some species (particularly one family of polychaetes and photid amphipods), but no change in the number of taxa (3). Total abundance was still reduced four months later, but not after six months. The densities of two megafaunal species (a tube-dwelling polychaete and a burrowing anemone) on an offshore bank were significantly reduced after commercial scallop vessels had worked the area (2).

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Auster et al. 1996	Stellwagen Bank, Gulf of Maine (USA)	20-55 m	Coarse sand	Disturbance of storm sand ripples and low sand waves, dispersal of shell deposits in wave troughs.		Examined gear tracks in side-scan sonar images.
2	Langton & Robinson 1990	Fippennies Ledge, Gulf of Maine (USA)	80-100 m	Gravelly sand with some gravel, shell hash, and small rocks	Coarser substrate, disruption of amphipod tube mats, piles of small rocks and scallop shells dropped from surface, S reductions in densities of tube dwelling polychaete and burrowing anemone.		Submersible observations made two years apart, before and after commercial dredging of area.
3	Watling et al. 2001	Damariscotta River, Maine (USA)	15 m	Silty sand	Loss of fine surficial sediments, lowered food quality of sediment, reduced abundance of some taxa, no changes in number of taxa, S reductions in total number of individuals 4 mos after dredging.	No recovery of fine sediments, full recovery of benthic fauna and food value within 6 mos.	Experimental study (23 tows in one day), effects on macrofauna (mostly infauna) evaluated 1 day and 4 and 6 mos after dredging.

Table 399 - Effects of New Bedford Scallop Dredges on Sand Habitat: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

9.3.1.2.4.2.2.2 New Bedford Scallop Dredges - Mixed Substrates

Three studies have been conducted on mixed glacially-derived substrates, two of them over 20 years ago and one 10 years ago (Table 400). All were done in the northwest Atlantic (one in the U.S. and two in Canada) at depths of 8 to 50 m. Two observational studies examined physical effects and one experimental study examined effects on sediment composition to a sediment depth of 9 cm. The experimental study evaluated the immediate effects of a single dredge tow. None of these studies evaluated habitat recovery or biological effects, although one (3) examined geochemical effects.

Physical effects

Direct observations in dredge tracks in the Gulf of St. Lawrence documented a number of physical effects to the seafloor, including bottom features produced by dredge skids, rings in the chain bag, and the tow bar (1,2). Gravel fragments were moved and overturned and shells and rocks were dislodged or plowed along the bottom (2). Sampling one day after a single dredge tow revealed that surficial sediments were re-suspended and lost and that the dredge tilled the bottom, burying surface sediments and organic matter to a depth of 9 cm, increasing the grain size of sediments above 5 cm, and disrupting a surface diatom mat (3). Microbial biomass at the sediment surface increased as a result of dredging.

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Caddy 1968	Northumberland Strait, Gulf of St. Lawrence, Canada	20 m	Mud and sand	Drag tracks (3 cm deep) produced by skids, smooth ridges between them produced by rings in drag belly, dislodged shells in dredge tracks.		Diver observations of physical effects of two tows.
2	Caddy 1973	Chaleur Bay, Gulf of St. Lawrence, Canada	40-50 m	Gravel over sand, with occasional boulders	Suspended sediment, flat track, marks left by skids, rings and tow bar, gravel fragments less frequent (many overturned), rocks dislodged or plowed along bottom.		Submersible observations of tow tracks made less than 1 hr after single dredge tows.
3	Mayer et al. 1991	Coastal Gulf of Maine (USA)	8 m	Mud, sand and shell hash	Lowered sediment surface by 2 cm,injection of organic matter and finer sediment into lower 5-9 cm, increased mean grain size in upper 5 cm, disruption of surface diatom mat, increased microbial biomass at sediment surface.		Experimental study, compared dragged and undragged sites before and 1day after a single dredge tow.

Table 400 - Effects of New Bedford Scallop Dredges on Mixed Substrate Habitat: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

9.3.1.2.4.2.3 Hydraulic Clam Dredges

9.3.1.2.4.2.3.1 Hydraulic Clam Dredges – Sand

Results of six hydraulic dredge studies in sandy substrates are summarized (Table 401). Five of them (2-6) examined the effects of "cage" dredges of the type used in the Northeast region of the U.S. and one (1) examined the effects of escalator dredges, which affect sandy bottom habitats similarly to "cage" dredges. Three of them were published prior to 1990, and three since then. Three were performed in North America (two in the U.S. and one in Canada), one in the Adriatic Sea and two in Scotland. There have been no published studies in North America since 1982. One of the North American studies was conducted on the U.S. continental shelf at a depth of 37 m and two in near shore waters and depths of 7 – 12 m. The two European studies were done in even shallower water (1.5 – 7 m). The North American studies were all observational in nature and the European studies were controlled experiments. One study compared effects in commercially dredged and un-dredged areas and four were conducted in un-dredged areas. The sixth study compared infaunal communities in an actively dredged, a recently dredged, and an un-dredged location off the New Jersey coast. All six studies examined physical and biological effects of dredging. Recovery was evaluated in four cases for periods ranging from just a few minutes (sediment plumes) to 11 weeks.

Physical effects

Hydraulic clam dredges created steep-sided trenches 8-30 cm deep that started deteriorating immediately after they were formed (1, 3-6). Trenches in a shallow, inshore location with strong bottom currents filled in within 24 hours (4). Trenches in shallow, protected, coastal lagoons were still visible two months after they were formed (5). Hydraulic dredges also fluidized sediments in the bottom and sides of trenches (6), created mounds of sediment along the edges of the trench (6), re-suspended and dispersed fine sediment (4), and caused a re-sorting of sediments that settled back into trenches (2). In one study (6), sediment in the bottom of trenches was initially fluidized to a depth of 30 cm and in the sides of the trench to 15 cm. After 11 weeks, sand in the bottom of the trench was still fluidized to a depth of 20 cm. Silt clouds only last for a few minutes or hours (3,4). Complete recovery of seafloor topography, sediment grain size, and sediment water content was noted after 40 days in a shallow, sandy environment that was exposed to winter storms (1).

Biological effects

Some of the larger infaunal organisms (e.g., polychaetes, crustaceans) retained on the wire mesh of the conveyor belt used in an escalator dredge, or that drop off the end of the belt, presumably die (1). Benthic organisms that are dislodged from the sediment, or damaged by the dredge, temporarily provided food for foraging fish and invertebrates (1,4). Hydraulic dredging caused an immediate and significant reduction in the total number of infaunal organisms in two studies (1,6) and in the number of macrofaunal organisms in a third study (5). There were also significant reductions in the number of infaunal species in one case (6) and in the number of macrofaunal species and biomass in another (5). In this study (5), polychaetes were most affected. One study failed to detect any reduction in the abundance of individual taxa (1). Evidence from the study conducted off the New Jersey coast indicated that the number of infaunal organisms and species, and species composition, were the same in actively dredged and un-dredged locations (2).

Recovery times for infaunal communities were estimated in three studies. All of them (1,5,6) were conducted in very shallow (1.5-7 m) water . Total infaunal abundance and species diversity had fully recovered only five days after dredging in one location where tidal currents reach maximum speeds of three knots (6). Some species had recovered after 11 weeks. Total abundance recovered 40 days after dredging in another location exposed to winter storms, when the site was re-visited for the first time (1). Total infaunal abundance (but not biomass) recovered within two months at a protected, commercially exploited site (5), where recovery was monitored at three-week intervals for two months, but not at a nearby, unexploited site. The actual recovery time at the exposed sub-tidal site (1) was probably much quicker than 40 days, the only point in time when the post-experimental observations were made.

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Hall et al. (1990)	Scotland	7 m	Fine sand	Shallow trenches (25 cm deep) and large holes, sediment "almost fluidized," S increase in median grain size in trenches, S reductions in numbers of infaunal organisms, no effect on abundance of individual species, some mortality (not assessed) of large polychaetes and crustacea retained on conveyor belt or returned to sea surface.	Complete recovery of physical features and benthic community after 40 days, filling of trenches and holes accelerated by winter storms.	Experimental study in unexploited area to evaluate effects of commercial escalator dredging activity, recovery evaluated after 40 days.
2	MacKenzie, 1982	Southern New Jersey (USA)	37 m	Very fine to medium sand	Re-sorting of sediments, no effect on number of infaunal individuals or species, or on species composition.		Comparison of actively fished, recently fished and never fished areas on the continental shelf.
3	Medcof & Caddy 1971	Southern Nova Scotia (Canada)	7-12 m	Sand and sand-mud	Smooth tracks with steep walls, 20 cm deep; sediment cloud.	Sediment plume lasted 1 minute; dredge tracks still clearly visible after 2-3 days.	SCUBA & submersible observations of the effects of individual tows.
4	Meyer et al. 1981	Long Island, New York (USA)	11 m	Very fine to medium sand	>20 cm deep trench, mounds on either side of trench, silt cloud, attraction of predators.	Trench nearly indistinct, predator abundance normal after 24 hours; silt settled in 4 minutes.	SCUBA observations following a single tow in a closed area, effects evaluated after 24 hrs.

Table 401 - Effects of Hydraulic Clam Dredges on Sand Substrate Habitat: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

5	Pranovi & Giovanardi 1994	Adriatic Sea (Italy)	1.5-2 m	Sand	8-10 cm deep trench; S decrease in total abundance, biomass, and diversity of benthic macrofauna in fishing ground; no S effects outside fishing ground.	After 2 mos, dredge tracks still visible, densities (especially of small species and epibenthic species) in fishing ground recovered, biomass did not.	Experimental dredging (single tow) in previously dredged and undredged areas in coastal lagoon, recovery monitored every 3 weeks for 2 mos.
6	Tuck et al. 2000	Outer Hebrides, Scotland	2-5 m	Medium to fine sand	Steep-sided trenches (30 cm deep), sediments fluidized up to 30 cm, S decrease in total abundance and number of infaunal species, polychaetes most affected.	Trenches no longer visible but sand still fluidized after 11 weeks, species diversity and total abundance recovered within 5 days, abundance of some species recovered after 11 weeks.	Experimental dredging (individual tows at 6 sites) in area closed to commercial dredging, recovery evaluated after 11 weeks.

Table 401 - Effects of Hydraulic Clam Dredges on Sand Substrate Habitat: Summary of Published Studies(cont.)

9.3.1.2.4.2.3.2 Hydraulic Clam Dredges - Mixed Substrates

An in situ evaluation of hydraulic dredge effects in sand, mud, and coarse gravel in the mid-Atlantic Bight indicated that trenches fill in quickly, within several days in fine sediment and more rapidly than that in coarse gravel (Table 402). Dredging dislodged benthic organisms from the sediment, attracting predators.

Reference	Location	Depth	Sediment	Effects	Recovery	Approach
Murawski & Serchuk 1989	Mid-Atlantic Bight, USA	Not given	Sand, mud and coarse gravel	Trench cut, temporary increase in turbidity, disruption of benthic organisms in dredge path, attraction of predators.	Trenches filled quickly in coarse gravel, but took several days in fine sediments.	Submersible observations following hydraulic cage dredge tows.

Table 402 - Effects of Hydraulic Clam Dredges on Mixed Substrate Habitat: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

9.3.1.2.4.2.4 Multiple Gear Types

9.3.1.2.4.2.4.1 Multiple Gear Types – Sand

The results of a single observational study of multiple gear types on sand habitats (at depths that varied from 15 to 70 m) are summarized in this report (Table 403). This study (2) compared sandy shallow and deep water sites on the south coast of England that were exposed to low, medium, and high levels of fishing effort by mobile and fixed gear. Low effort areas that were closed to trawls and dredges had more emergent epifauna (soft corals and hydroids) and were dominated by relatively high-biomass epifauna and infauna, whereas high effort areas fully exposed to fixed and mobile gear had higher abundances of small-bodied organisms. Deep (53-70 m) coarse-medium sand offshore sites were more affected by fishing than deep, medium sand or shallow (15-17 m), inshore, fine sand sites.

Reference	Location	Depth	Sediment	Effects	Recovery	Approach
Kaiser et al. 2000b	England (South Devon Coast)	15-70 m	Fine, medium, and coarse sand	No S effect of high fishing effort on numbers of infaunal or epifaunal species or individuals; reduced abundance of larger, less mobile, and emergent epifauna, higher abundance of more mobile species, fewer high-biomass organisms and more smaller-bodied species in high effort areas, infauna in deeper coarse-medium sand habitat most affected by fishing.		Compared benthic communities in areas of high, medium and low fishing intensity by fixed and mobile gears.

Table 403 - Effects of Multiple Gears on Sand Substrate Habitat: Summary of Published Studies

9.3.1.2.4.2.4.2 Multiple Gear Types – Gravel/Rock

Two recent observational studies of mobile gear effects on sediments and epifauna in gravel bottom on the northern edge of eastern Georges Bank (42-90 m) are summarized (Table 404). Study sites were distinguished by depth and the presence or absence of fishing disturbance. Sediments in undisturbed sites were slightly coarser with more sand and cobble. There were significantly more organisms, higher biomass, and greater species diversity at the undisturbed sites in both depths, but there were also significantly higher values in disturbed and undisturbed deep sites than in disturbed and undisturbed shallow sites. Percent cover of an encrusting colonial polychaete was also significantly higher at these sites, but emergent hydroids and bryozoans were significantly more abundant in deep, undisturbed sites and at shallow, disturbed sites. Overall, emergent epifauna was more abundant in deep water, but there was no significant disturbance effect.

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1,2	Collie et al. 1997, 2000	Eastern Georges Bank (U.S. and Canada)	42-90 m	Pebble/cobble "pavement" with some overlying sand	S higher total densities, biomass, and species diversity in undisturbed sites, but also in deeper water (i.e. effects of fishing could not be distinguished from depth effects), 6 species abundant at U sites, rare or absent at D sites; sediments in U sites slightly coarser with more sand and cobble; percent cover of tube-dwelling polychaetes, hydroids, and bryozoans S higher in deep water, but no disturbance effect.		Benthic sampling, video and still photos in two shallow (42-47 m) and four deep (80-90 m) sites disturbed (D) and undisturbed (U) by trawls and scallop dredges.

Table 404 - Effects of Multiple Gear Types on Gravel/Rocky Substrate: Summary of Published Studies

S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

9.3.1.2.4.2.4.3 Multiple Gear Types - Mixed Substrates

Six observational studies of the effects of multiple gear types on mixed substrates are summarized (Table 405). Surveys were conducted in the Gulf of Maine inside and outside an inshore area closed to mobile fishing gear and in an offshore area that was disturbed by mobile fishing gear (1). A series of three publications examined long-term (100+ years) changes in benthic habitats and communities in the Wadden Sea, some of which were attributed to fishing (2-4). A study in New Zealand (5) tested ten predictions of how increasing fishing activity affects benthic communities by comparing benthic samples and underwater video footage from areas exposed to varying degrees of commercial fishing effort. A sixth study (6) examined areas on eastern Georges Bank that were affected by mobile bottom gear.

Significant increases were observed in the abundance of sea cucumbers and emergent epifauna, and in the number of bottom depressions created by organisms such as lobsters, scallops, and crabs, on sand-cobble-shell substrate inside the Gulf of Maine closed area (1). Side scan sonar and ROV surveys of Stellwagen Bank revealed evidence that otter trawls and New Bedford scallop dredges disturb sand waves and ripples, disperse shell deposits, remove emergent epifauna, and disturb microalgal cover (1). Disturbed sand and gravel areas of Georges Bank were characterized by trawl and dredge tracks, sparse epifauna, mounds of gravel presumably produced by fishing gear, and smoother bottom (6). In the New Zealand study (5), there were four significant effects of increased fishing activity by bottom trawls, Danish seines, and toothed scallop dredges in mud and sand substrates that were consistent across all sampling methodologies. These were reduced density of large epifauna, echinoderms, and long-lived surface dwelling organisms, and an increased density of small, opportunistic species. The loss of biogenic reefs and changes in benthic community composition (fewer mollusk and amphipod species and more polychaete species) in the Wadden Sea were in part attributed to fishing activity (2-4).

No.	Reference	Location	Depth	Sediment	Effects	Recovery	Approach
1	Auster et al. 1996	Coastal Gulf of Maine (USA)	30-40 m	Sand-shell	S more sea cucumbers and bottom depressions inside closed area.		ROV and video observations inside and outside an area closed to mobile gear for 10 years.
1	Auster et al. 1996	Coastal Gulf of Maine (USA)	30-40 m	Cobble-shell	S more emergent epifauna inside closed area.		ROV and video observations inside and outside an area closed to mobile gear for 10 years.
1	Auster et al. 1996	Stellwagen Bank (Gulf of Maine, USA)	20-55 m	Sand with gravel and shell	Disturbed sand ripples and sand waves, dispersed shell deposits, absence of epifauna and reduced microalgal cover in trawl and dredge tracks.		Side-scan sonar survey and ROV observations.
2,3,4	Reise and Schubert, 1987; Riesen and Reise 1982; Reise 1982	Wadden Sea (Netherlands)	<23 m	Mud, coarse sand and some pebbles	Loss of oyster and Sabelleria reefs, decrease in abundance of 28 species (molluscs and amphipods), 23 “new” species (mostly polychaetes).		Compared benthic surveys conducted during time period when oysters were over-exploited and trawl fishery developed on Sabellaria reefs (1869-1986)..

Table 405 - Effects of Multiple Gears on Mixed Substrate Habitat: Summary of Published Studies
S = statistically significant; U = undisturbed; D = disturbed; HT = heavily trawled; LT = lightly trawled

5	Thrush et al. 1998	Hauraki Gulf, New Zealand	17-35 m	Mud and sand	S reductions in density of large epifauna, echinoderms, and long-lived surface dwellers; S increases in density of small, opportunistic species; 15-20% variability in macrofaunal community composition attributed to fishing pressure.		Tested ten predictions of the effects of increasing fishing intensity on benthic community structure by comparing samples and video images from 18 stations exposed to varying degrees of commercial fishing pressure by bottom trawls, Danish seines, and scallop dredges.
6	Valentine and Lough 1991	Eastern Georges Bank		Sand and gravel	Trawl and dredge tracks in sediments, sparse epifauna, gravel mounds and smoother bottom in disturbed areas.		Side scan sonar and submersible observations of area presumed to be disturbed by trawls and scallop dredges.

Table 405 - Effects of Multiple Gears on Mixed Substrate Habitat: Summary of Published Studies(cont.)

9.3.1.3 Vulnerability of Essential Fish Habitat to Bottom-tending Fishing Gears

The purpose of this section is to evaluate potential adverse effects of bottom-tending fishing gears regulated by the Magnuson-Stevens Act (MSA) on benthic EFH in the Northeast region of the U.S. as required by the EFH final rule, 50 CFR 600.815(a)(2)(I). The EFH final rule recommends that the evaluation consider the effects of each fishing activity on each type of habitat found within the EFH for any affected species and life stage. The EFH rule further recommends that the following information be reviewed in making an evaluation: intensity, extent, and frequency of any adverse effects on EFH; the types of habitat within EFH that may be adversely affected; habitat functions that may be disturbed; and conclusions regarding whether and how each fishing activity adversely affects EFH.

9.3.1.4 Vulnerability Requirements

The EFH final rule requires that EFH designations be based upon the best available information. This information may fall into four categories that range from the least specific (Level 1) to the most specific (Level 4). These categories are defined as follows:

Level 1: Presence/absence data are available to describe the distribution of a species (or life history stage) in relation to potential habitats for portions of its range.
Level 2: Quantitative data (i.e., density or relative abundance) are available for the habitats occupied by a species or life history stage.
Level 3: Data are available on habitat-related growth, reproduction, and/or survival by life history stage.
Level 4: Data are available that directly relate the production rates of a species or life history stage to habitat type, quantity, and location.

Existing EFH designations in the Northeast region are based primarily on Level 2 information. This level of information is inadequate for making definitive determinations of the consequences of fishing-related habitat alterations on EFH for any species or life stage in the Northeast region because the habitat alterations caused by fishing can not be linked to any known effect on species productivity. Therefore, this section of the report qualitatively evaluates the vulnerability of benthic EFH for each species and life history stage (eggs, larvae, juveniles, adults, and spawning adults) in the Northeast region to the effects of five bottom-tending fishing gear types (Tables 6.1 – 6.42). Vulnerability is defined as the likelihood that the functional value of EFH would be adversely affected as a result of fishing. Given the limited nature of the information available for this evaluation, emphasis was placed on the identification of potential adverse impacts of fishing on benthic EFH.

Information used to perform these evaluations included: 1) the EFH designations adopted by the Mid-Atlantic, New England, and South Atlantic Fishery Management Councils; 2) the results of a Fishing Gear Effects Workshop convened in October 2001 (NREFHSC 2002); 3) the information provided in this report, including the results of existing scientific studies, and the geographic distribution of fishing gear use in the Northeast region; and 4) the habitats utilized by each species and life stage as indicated in their EFH designations and supplemented by other references.

9.3.1.5 Species-specific Vulnerability Tables

The following five fishing gear classifications were evaluated: otter trawls (OT); New Bedford style scallop dredges (SD); hydraulic clam dredges (CD); pots and traps (PT); and sink gill nets and bottom long lines (NL). Vulnerability was evaluated according to four broad categories: none (0); low (L); moderate (M); and high (H), based upon a matrix analysis of habitat function, habitat sensitivity and gear use. The matrix analysis consistently applied these criteria to all benthic life stages and species. Adult and spawning adult life stages were combined due to the difficulty in distinguishing between the two. In some cases (e.g., pelagic life stages that are not vulnerable to bottom-tending fishing gear effects) a vulnerability ranking was not applicable (NA).

A number of criteria were considered in the evaluation of the vulnerability of EFH for each species and life stage. The rationale for each determination is outlined by species in Tables 6.1 through 6.42. First, the habitat's value to each species and life stage was characterized to the extent possible, based on its function in providing shelter, food and/or the right conditions for reproduction. For example, if the habitat provided shelter from predators for juvenile or other life stages, gear impacts that could reduce shelter were of greater concern. In cases where a food source was closely associated with the benthos (e.g. infauna), the ability of a species to use alternative food sources was evaluated. Additionally, since benthic prey populations may also be adversely affected by fishing, gear impacts that could affect the availability of prey for bottom-feeding species or life stages were of greater concern than if the species or life stages were piscivorous. In most cases habitat usage was determined from the information provided in the EFH Source Documents (NOAA Technical Memorandum NMFS-NE issues 123-153) with additional information from Colette and Klein-MacPhee (2002).

Another criterion was the sensitivity of the habitat to disturbance and its ability to recover from any effects of fishing given the range of natural disturbances experienced in the environment. These considerations took into account available information on the energy level of the natural environment, including the degree of disturbance from tidal and storm-related currents. High-energy sand habitats were considered to be less vulnerable to fishing gear effects than low energy deep-water habitats or structurally complex habitats. This concept is adopted from the models developed by Auster and Langton (1999) and the Northeast Fishing Gear Effects Workshop (NREFHSC 2002).

The extent to which each of the five bottom-tending gear types is used in areas that are designated as EFH for any given species and life stage was evaluated by examining the spatial distribution of fishing activity for individual gears for the period 1995-2001. Maps of fishing activity within ten-minute squares of latitude and longitude were derived from NMFS vessel trip report and clam logbook databases. Squares were ranked according to the number of trips for fixed gear, and either the number of hours absent from port or the number of hours fishing for mobile gears. This evaluation included the predominant substrates and depth ranges in which each gear is used. Habitats or areas that are not normally fished with a particular gear were considered to be less vulnerable to that gear.

The pot/trap and net/line gear types were considered to have the least impact of the five gear types evaluated. Based on the limited information available (Eno *et al.* 2001, NREFHSC 2002), the vulnerability of all EFH to pot and trap usage was considered to be low and is not discussed in the species accounts. Similarly, there is little scientific information that evaluates the effects of gill nets and long-lines on benthic marine habitats, and none evaluates these effects in the Northeast region. The panel of experts that met in October 2001 ranked their concern over impacts from fixed gear well below concern about mobile bottom-tending gears (NREFHSC 2002). Like pots and traps, the vulnerability of EFH for all benthic species and life stages to nets and lines was rated as low (L) and is not discussed in the species accounts.

The greatest concern is for the vulnerability of benthic EFH to mobile bottom-tending gears, which is addressed by species in Table 406- Table 447. In the Northeast U.S., these gear types include various types of bottom otter trawls, New Bedford scallop dredges, and hydraulic clam dredges. Otter trawls are responsible for most of the fisheries landings throughout the Northeast region. They are used in a variety of substrates, depths, and areas. Scallop dredges are used in sand and gravel substrates, and hydraulic dredges are used only in sand, shell, and small gravel within well-defined areas.

The information in the species EFH vulnerability tables is arranged in columns that summarize the geographical extent of EFH for each life stage, its depth range, seasonal occurrence, and a brief EFH description that includes – for benthic life stages – substrate characteristics. The information in columns 2-5 was derived from EFH designations that have been adopted by the three Atlantic coast Fishery Management Councils. Additional information is provided at the bottom of each table to explain the rationale that was used in making the gear-specific EFH vulnerability rankings. This information was extracted from the EFH source documents and other sources and sometimes differs somewhat from the information included in the EFH designation.

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB and estuaries from Passamaquoddy Bay to Saco Bay, ME and from Mass. Bay to Cape Cod Bay, MA	30 - 90	All year in GOME Dec - June on GB Peaks April & May both	Surface waters	NA	NA	NA	NA	NA
Larvae	GOME, GB, Southern NE and estuaries from Passamaquoddy Bay to Saco Bay, ME and from Mass Bay to Cape Cod Bay, MA	30-130	Between January and August, with peaks in April and May	Surface waters	NA	NA	NA	NA	NA
Juveniles	GOME and estuaries from Passamaquoddy Bay to Saco Bay, ME and from Mass Bay to Cape Cod Bay, MA	45-150		Bottom habitats with fine-grained sediments or substrate of sand or gravel	M	M	0	L	L
Adults	GOME, GB and estuaries from Passamaquoddy Bay to Saco Bay, ME and from Mass Bay to Cape Cod Bay, MA	45-175		Bottom habitats with fine-grained sediments or a substrate of sand or gravel	H	H	0	L	L
Spawning Adults	GOME, GB and estuaries from Passamaquoddy Bay to Saco Bay, ME and from Mass Bay to Cape Cod Bay, MA	<90	March through June	Bottom habitats of all substrate types	H	H	0	L	L

Rationale: American plaice (Hippoglossoides platessoides) juveniles, adults, and spawning adults are concentrated in the Gulf of Maine, where they occupy a variety of habitat types with substrates of gravel or fine grained sediments including sand. Plaice avoid rocky and hard bottom areas and prefer fine, sticky but gritty sand mixtures and mud, as well as oozy mud in deep basins (Klein-MacPhee 2002a). Plaice have been caught a considerable distance off the bottom and move off the bottom at night (Klein-MacPhee 2002a). They feed primarily on epibenthic invertebrates (mostly echinoderms and amphipods), so there is a potential that prey resources may be affected adversely by otter trawls and scallop dredges, particularly in areas of lower energy and expected slower habitat recovery. EFH vulnerability to these gears was rated as high for adults and moderate for juveniles primarily because spawning occurs on the bottom. Since hydraulic clam dredges do not typically operate in the Gulf of Maine, vulnerability for this gear was rated as none.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year; OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT Pots and Traps; NL - Gill Nets and Longlines; NA - not applicable; 0 –No vulnerability; L - Low vulnerability; M - Moderate vulnerability; H - High vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 406 - American Plaice EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Englishman/ Machias Bay to Blue Hill Bay; Sheepscot R., Casco Bay, Saco Bay, Great Bay, Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	<110	Begins in fall, peaks in winter and spring	Surface waters	NA	NA	NA	NA	NA
Larvae	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Passamaquoddy Bay to Penobscot Bay; Sheepscot R., Casco Bay, Saco Bay, Great Bay, Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	30-70	Spring	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	25 - 75		Bottom habitats with a substrate of cobble or gravel	H	H	0	L	L
Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	10-150		Bottom habitats with a substrate of rocks, pebbles, or gravel	M	M	L	L	L
Spawning Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and following estuaries: Englishman/ Machias Bay to Blue Hill Bay; Sheepscot R., Mass Bay, Boston Harbor, Cape Cod Bay, MA	10-150	Spawn during fall, winter, and early spring	Bottom habitats with a substrate of smooth sand, rocks, pebbles, or gravel	M	M	L	L	L

Table 407 - Atlantic Cod EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Rationale: Atlantic cod (Gadus morhua) are distributed regionally from Greenland to Cape Hatteras, NC, from nearshore to depths greater than 400 m. In U.S. waters, they are concentrated on Georges Bank and in the Gulf of Maine, on rough bottom from 10 - 150 m (Klein-MacPhee 2002b; Fahay et al. 1999). Eggs and larvae are pelagic so EFH vulnerability is not applicable.

Juvenile cod are found mostly in nearshore shoal waters or on offshore banks. Cobble is preferred over finer grained sediments, and this life stage appears to use benthic structure and cryptic coloration to escape from predation (Fahay et al. 1999). Juvenile cod may benefit, perhaps strongly, from physical and biological complexity (Lindholm et al. 2001) (see discussion in 9.3.1.2.4). Otter trawls and scallop dredges have been shown to reduce habitat complexity (see Section 9.3.1.2.4) therefore EFH Vulnerability to these gear types is rated as high since the gear may affect the functional value of EFH for this life stage. Vulnerability to clam dredges was rated as none since this gear is not operated in juvenile cod EFH (see 9.3.1.2.3).

Adults and spawning adults occupy a variety of hard bottom habitat types including rock, pebbles, and gravel, and tend to avoid finer sediments. Cod are euryphagous, eating a wide variety of prey including fish, decapods, amphipods, and polychaetes (Fahay et al. 1999). Although adult cod are primarily found on rough bottom, the scientific literature does not indicate that this habitat type serves the same function as it does for juvenile cod, which is ranked as high. Based on the variable diet and lack of evidence for direct functional value of benthic habitat. EFH vulnerability to otter trawls and scallop dredges is rated as moderate. Adult cod may use areas where clam dredges operate, such as the nearshore waters of New Jersey, on a seasonal basis. Clam dredges operate only in sand (NREFHSC 2002), and the recovery of benthic communities from the effects of clam dredging in nearshore, sandy habitats is fairly rapid. Clam beds are not chronically disturbed by dredging since the population of clams, which are benthic infauna, must recover before fishing is again profitable (NREFHSC 2002). Based on this information and the rationale described for otter trawls and scallop dredges, habitat vulnerability for hydraulic clam dredges was rated as low. EFH vulnerability for adults applies to spawning adults as well.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 – No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 407 - Atlantic Cod EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB		Between late fall and early spring, peak Nov. and Dec.	Pelagic waters to the sea floor	0	0	0	0	0
Larvae	GOME, GB			Surface waters	NA	NA	NA	NA	NA
Juveniles	GOME, GB	20 - 60		Bottom habitats with a substrate of sand, gravel, or clay	M	M	0	L	L
Adults	GOME, GB	100-700		Bottom habitats with a substrate of sand, gravel, or clay	M	M	0	L	L
Spawning Adults	GOME, GB	<700	Between late fall and early spring, peaks in Nov. and Dec.	Bottom habitats with a substrate of soft mud, clay, sand, or gravel; rough or rocky bottom locations along slopes of the outer banks	M	M	0	L	L

Rationale: Atlantic halibut (Hippoglossus hippoglossus) are found in the boreal and subarctic Atlantic, south to New Jersey, and were once fairly common from Nantucket Shoals to Labrador (Klein-MacPhee 2002a). They have been found at depths from 25 m to 1000 m, but 700 - 900 m is probably the deepest they are found in any numbers.

Atlantic halibut eggs are bathy-pelagic and are fertilized on the bottom (Klein-MacPhee 2002a, Cargnelli et al. 1999g). Since eggs occur close to, but not on the bottom, scallop dredges, otter trawls, and hydraulic clam dredges are not expected to affect the functional value of the habitat for this life stage and EFH vulnerability was rated as none.

Juvenile, adult and spawning adult halibut occupy a variety of habitat types north of Nantucket Shoals. Adults are not found on soft mud or on rock bottom (Cargnelli et al. 1999g), however, spawning is occasionally associated with complex habitats. Juvenile halibut feed mostly on annelid worms and crustaceans, then transition to a diet of mostly fish as adults (Klein-MacPhee 2002a). EFH vulnerability to scallop dredges and otter trawls was rated as moderate for juveniles and adults. EFH vulnerability for clam dredges was rated as none since this gear type does not operate in halibut EFH (see 9.3.1.2.3).

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 408 - Atlantic Halibut EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB and following estuaries: Englishman/ Machias Bay, Casco Bay, & Cape Cod Bay	20 - 80	July through November	Bottom habitats with a substrate of gravel, sand, cobble, shell fragments & aquatic macrophytes, tidal currents 1.5-3 knots.	L	L	0	L	L
Larvae	GOME, GB, Southern NE and following estuaries: Passamaquoddy Bay to Cape Cod Bay, Narragansett Bay, & Hudson R./ Raritan Bay	50 - 90	Between August and April, peaks from Sept. - Nov.	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	GOME, GB, Southern NE and Middle Atlantic south to Cape Hatteras and following estuaries: Passamaquoddy Bay to Cape Cod Bay; Buzzards Bay to Long Island Sound; Gardiners Bay to Delaware Bay	15-135		Pelagic waters and bottom habitats	NA	NA	NA	NA	NA
Adults	GOME, GB, southern NE and middle Atlantic south to Cape Hatteras and following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Cape Cod Bay; Buzzards Bay to Long Island Sound; Gardiners Bay to Delaware Bay; & Chesapeake Bay	20-130		Pelagic waters and bottom habitats	NA	NA	NA	NA	NA

Table 409 - Atlantic Herring EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Spawning Adults	GOME, GB, southern NE and middle Atlantic south to Delaware Bay and Englishman/ Machias Bay Estuary	20 - 80	July through November	Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, also on aquatic macrophytes	L	L	0	L	L

Rationale: Atlantic herring (Clupea harengus**)** is a coastal pelagic species ranging from Labrador to Cape Hatteras in the western Atlantic (Reid et al. 1999,
Munroe 2002). For most pelagic life stages (larvae, juveniles, adults) EFH vulnerability to bottom-tending fishing gear is not applicable. Atlantic herring eggs are laid in high energy, benthic habitats on rocky, pebbly, gravelly or shell substrates or macrophytes (Reid et al. 1999, Munroe 2002). These habitats are less susceptible to fishing gear impacts since they have evolved under a high energy disturbance regime (strong bottom currents). Vulnerability of herring egg EFH to scallop dredges and otter trawls is considered to be low. Although these gears may directly effect the eggs, only the effect of the gear on the functional value of the habitat was considered for this evaluation. EFH vulnerability from clam dredges were considered to be none since this gear does not operate in areas of herring egg EFH.

Spawning adults are c losely associated with the bottom. Effects on the functional value of habitat from mobile gears are unknown and were rated as low since spawning occurs on the bottom. EFH vulnerability from clam dredges was rated as none for the reasons described above. Spawning could be disrupted by noise associated with these gears, but this issue was not addressed as a habitat related issue.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 409 - Atlantic Herring EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (cm)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Rivers from CT to Maine: Connecticut, Pawcatuck, Merrimack, Cocheco, Saco, Androscoggin, Presumpscot, Kennebec, Sheepscot, Ducktrap, Union, Penobscot, Narraguagus, Machias, East Machias, Pleasant, St. Croix, Denny=s, Passagassawaukeag Aroostook, Lamprey, Boyden, Orland Rivers, and the Turk, Hobart & Patten Streams; and the following estuaries for juveniles and adults: Passamaquoddy Bay to Muscongus Bay; Casco Bay to Wells Harbor; Mass Bay, Long Island Sound, Gardiners Bay to Great South Bay. All aquatic habitats in the watersheds of the above listed rivers, including all tributaries to the extent that they are currently or were historically accessible for salmon migration.	30-31	Between October and April	Bottom habitats with a gravel or cobble riffle (redd) above or below a pool in rivers	NA	NA	NA	NA	NA
Larvae			Between March and June for alevins/fry	Bottom habitats with a gravel or cobble riffle (redd) above or below a pool in rivers	NA	NA	NA	NA	NA
Juveniles		10-61		Bottom habitats of shallow gravel/cobble riffles interspersed with deeper riffles and pools in rivers and estuaries, water velocities between 30 – 92 cm/sec	NA	NA	NA	NA	NA
Adults				Oceanic adult Atlantic salmon are primarily pelagic and range from waters of the continental shelf off southern NE north throughout the GOME, dissolved oxygen above 5 ppm for migratory pathway	NA	NA	NA	NA	NA

Table 410 - Atlantic Salmon EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (cm)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Spawning Adults		30-61 cm	October and November	Bottom habitats with a gravel or cobble riffle (redd) above or below a pool in rivers	NA	NA	NA	NA	NA

Rationale: Atlantic salmon (Salmo salar**)** eggs and larvae are found in riverine areas where the fishing gears under consideration are not used, so EFH vulnerability is not applicable. It is important to note that these life stages are particularly vulnerable to non-fishing related impacts such as point source discharges and polluted runoff. Juveniles and adults are pelagic in nature, and vulnerability of EFH to bottom-tending fishing gear is not applicable for these life stages.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0- No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 410 - Atlantic Salmon EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth[1] (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, southern NE and middle Atlantic south to Virginia-North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Mass Bay, and Cape Cod Bay		May through October, peaks in May and June in middle Atlantic area, and in Sept. and Oct. on GB and GOME	Bottom habitats	L	L	L	L	L
Larvae	GOME, GB, southern NE and middle Atlantic south to Virginia-North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Mass Bay, and Cape Cod Bay			Pelagic waters[1] and bottom habitats[2] with a substrate of gravelly sand, shell fragments, pebbles, or on various red algae, hydroids, amphipod tubes and bryozoans	NA[1] L[2]	NA[1] L[2]	NA[1] L[2]	NA[1] L[2]	NA[1] L[2]
Juveniles	GOME, GB, southern NE and middle Atlantic south to Virginia-North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Great Bay, Mass Bay, and Cape Cod Bay	18-110		Bottom habitats with a substrate of cobble, shells, and silt	L	L	L	L	L
Adults	GOME, GB, southern NE and middle Atlantic south to Virginia-North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Great Bay, Mass Bay, and Cape Cod Bay	18-110		Bottom habitats with a substrate of cobble, shells, coarse/gravelly sand, and sand	L	L	L	L	L
Spawning Adults	GOME, GB, southern NE and middle Atlantic south to Virginia-North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Mass Bay, and Cape Cod Bay	18-110	May through October, peaks in May and June in middle Atlantic area, and in Sept. and Oct. on GB and in GOME	Bottom habitats with a substrate of cobble, shells, coarse/gravelly sand, and sand	L	L	L	L	L

Table 411 - Atlantic Sea Scallop EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth [1] (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability

[1] Depth range given in EFH description.

Juvenile and adult sea scallops (***Placopecten magellanicus***) are found on the continental shelf of the northwest Atlantic, from the Gulf of St. Lawrence south to Cape Hatteras typically between 18 and 110 m, but also as shallow as 2 m in estuaries and embayments along the Maine coast and as deep as 384 m (Packer et al. 1999a). In the Gulf of Maine, populations have been reported at depths of 170-180 m. Scallops are rarely found at depths <55 m in "southern areas."

Rationale: Scallop eggs are slightly heavier than seawater and are thought to remain on the bottom during development, but bottom habitats have no known functio nal value for eggs and therefore their vulnerability to fishing was rated as low for all gear types. There are four pelagic larval stages and EFH vulnerability to fishing gear impacts for these larval stages is not applicable. However, the last larval stage is benthic; at this stage larvae settle to the bottom (as "spat") and attach to hard surfaces (Packer et al. 1999a). Settlement occurs in areas of gravelly sand with shell fragments. Spat are very delicate and do not surviv e on shifting sand bottoms. The availability of suitable surfaces on which to settle appears to be a primary requirement for successful reproduction (Packer et al. 1999a). There is a close association between the bryozoan, *Eucratea loricata*, and spat. *Eucratea* attach to adult scallops, and have been found to contain large numbers of spat. EFH for benthic phase larvae was given a low rating for vulnerability to all three mobile gear types because any disturbance of the bottom they would cause would most likely re-distribute bottom sediments suitable for settlement (gravel, pebbles, shell fragments), but not reduce their availability. Juveniles are found mainly on gravel, small rocks, shells, and silt. During their second growing season (5-12 mm) they become mobile and leave the original substrate on which they settled and re-attach to shells and bottom debris. Otter trawls, scallop dredges and hydraulic clam dredges are used in bottom habitats occupied by juvenile scallops, but the disturbance of the seafloor caused by these gears does not adversely affect the functional value of the habitat and therefore the vulnerability of juvenile scallop EFH to mobile benthic gears was rated as low. The same conclusion was reached for fixed gear which cause negligible disturbance to the seafloor. Juveniles and adults are found in benthic habitats with at least some water movement, which is critical for feeding, oxygen and removal of waste; optimal growth for adults occurs at 10 cm/sec (Packer et al. 1999a). Adult scallops inhabit coarse substrates, usually gravel, shell, and rock. Because fine clay particles interfere with feeding activity, scallops are not usually found on muddy bottom. No scientific information exists that indicates mobile fishing gears have a negative im pact on the functional value of adult scallop EFH. The vulnerability of adult scallop EFH to mobile benthic gears was therefore rated as low.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England;
OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT- Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable;
L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat

Table 411 - Atlantic Sea Scallop EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear (cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GB southwest to Nantucket Shoals and coastal areas of GOME and the following estuaries: Great Bay, Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	50 - 90	March to May, peak in April	Surface waters	NA	NA	NA	NA	NA
Larvae	GB southwest to the middle Atlantic south to Delaware Bay and the following estuaries: Great Bay, Mass Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay, and Narragansett Bay	30 - 90	January to July, peak in April and May	Surface waters	NA	NA	NA	NA	NA
Juveniles	GB, GOME, middle Atlantic south to Delaware Bay	35-100		Bottom habitats with a substrate of pebble gravel	H	H	L	L	L
Adults	GB and eastern side of Nantucket Shoals, throughout GOME, *additional area of Nantucket Shoals, and Great South Channel	40-150		Bottom habitats with a substrate of broken ground, pebbles, smooth hard sand, and smooth areas between rocky patches	H	H	L	L	L

Table 412 - Haddock EFH - Vulnerability to Effect of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Spawning Adults	GB, Nantucket Shoals, Great South Channel, throughout GOME	40-150	January to June	Bottom habitats with a substrate of pebble gravel or gravelly sand	H	H	L	L	L

Rationale: Haddock (Melanogrammus aeglefinus**)** are found from Greenland to Cape Hatteras and are common throughout the Gulf of Maine, Georges Bank, and southern New England (Cargnelli et al. 1999f, Klein-MacPhee 2002b). Juveniles older than 3 months and adults are demersal and generally found in waters from 10 to 150 m in depth. Juveniles are usually found in waters shallower than 100 m. Haddock spawn over pebble gravel substrate, and avoid ledges, rocks, kelp and soft mud (Cargnelli et al. 1999f). Haddock eggs and larvae are pelagic, and EFH vulnerability to fishing gear is not applicable.

Juvenile haddock, like juvenile cod, may benefit, perhaps strongly, from physical and biological complexity. In general, haddock have a stronger benthic affinity than cod (Klein-MacPhee 2002b). Juvenile haddock are chiefly found over pebble gravel substrates (Cargnelli et al. 1999f). Once demersal, they feed on benthic fauna, and their primary prey items are crustaceans and polychaetes. The habitat complexity that appears to be important to juvenile haddock can be reduced by otter trawls and scallop dredges, and benthic prey may be affected. Juvenile haddock EFH is considered to be highly vulnerable to these two gear types. Vulnerability to clam dredges was rated as low since there is some use of this gear in juvenile EFH.

Adult haddock are found on broken ground, gravel, pebbles, clay, smooth sand, and sticky sand of gritty consistency, with a preference for smooth areas around rock patches (Klein-MacPhee 2002b). They feed indiscriminately on benthic invertebrates, and occasionally on fish. Adults (including spawning adults) occupy a variety of habitat types which may be affected by otter trawls and scallop dredges. Adults may be less closely linked to complex habitats then juveniles, but there is still some association. Haddock are expected to be more strongly linked to benthic habitats than cod since haddock primarily feed on benthic invertebrates while cod are primarily piscivorous. Benthic prey resources for haddock may be adversely affected by scallop dredges or otter trawls in areas of lower energy and expected slower habitat recovery. Overall, adult EFH vulnerability to these gear types is rated as high. Clam dredges operate only in sand and the associated recovery period is short (Table 5.15). Moreover, clam dredging is not expected to create a chronic disturbance in these areas since the population of clams, which are benthic infauna, must recover before fishing is again profitable therefore, habitat vulnerability for clam dredges is rated as low.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 412 - Haddock EFH - Vulnerability to Effect of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras, North Carolina	15-1000	March to September	Surface waters	NA	NA	NA	NA	NA
Larvae	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras, North Carolina	25-1000	March to September	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, all areas of GOME	25-200		Bottom habitats with substrates of a sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud	L	L	L	L	L
Adults	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, outer perimeter of GB, all areas of GOME	25-200		Bottom habitats with substrates of a sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud	L	L	L	L	L

Table 413 - Monkfish EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Spawning Adults	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, outer perimeter of GB, all areas of GOME	25-200	February to August	Bottom habitats with substrates of a sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud	L	L	L	L	L
Rationale: Monkfish (Lophius americanus), are demersal anglerfish found from Newfoundland south to Florida, but are common only north of Cape Hatteras (Steimle et al. 1999c). Juveniles are primarily found at depths between 40-75 m while adults are concentrated between 50-100 m. In the Gulf of Maine, adults occur primarily between the depths of 130 - 260 m. Occasionally, adults are seen at the surface. Both juveniles and adults (including spawning adults) occur on substrates ranging from mud to gravelly sand, algae and rocks. A monkfish has been observed digging depressions in the bottom substrate with its pectoral fins until its back was almost flush with the surrounding bottom (Caruso 2002). The monkfish is a sight predator which uses its highly modified first dorsal fin as an angling apparatus to lure small fishes towards its mouth (Caruso 2002). Monkfish eat a wide array of prey items, but mainly fish and cephalopods. Monkfish have been reported to ingest a variety of seabirds. There are no indications in the literature that any monkfish life stage is habitat limited or that the functional value of its habitat could be adversely affected by fishing. Vulnerability of adult and juvenile EFH to mobile fishing gear was rated as low. Monkfish eggs and larvae are pelagic, and vulnerability to bottom-tending fishing gear is not applicable.									
Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**									

Table 413 - Monkfish EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay and Cape Cod Bay	<50	Late fall and winter	Bottom habitats, generally hard bottom sheltered nests, holes, or crevices where they are guarded by parents	H	H	H	L	L
Larvae	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay and Cape Cod Bay	<50	Late fall to spring	Bottom habitats in close proximity to hard bottom nesting areas	H	H	H	L	L
Juveniles	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor and Cape Cod Bay	<80		Bottom habitats, often smooth bottom near rocks or algae	H	H	H	L	L
Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, Boston Harbor and Cape Cod Bay	<110		Bottom habitats, dig depressions in soft sediments which are then used by other species	H	H	H	L	L

Table 414 - Ocean Pout EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Spawning Adults	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass Bay, and Cape Cod Bay	<50	Late summer to early winter, peaks in Sept. and October	Bottom habitats with a hard bottom substrate, including artificial reefs and shipwrecks	H	H	H	L	L

Rationale: Ocean pout (Zoarces americanus**)** is a demersal species found in the western Atlantic from Labrador south to Cape Hatteras (Steimle et al. 1999e). It can occur in deeper waters south of Cape Hatteras, and has been found as deep as 363 m (Klein-MacPhee and Collette 2002a). It is found in most estuaries and embayments in the Gulf of Maine, and is caught in greatest abundance by the NEFSC trawl survey off southern New England (Steimle et al. 1999e).

Ocean pout eggs are laid in nests in crevices, on hard bottom or in holes and protected by the female parent for 2.5 to 3 months until they hatch (Klein-MacPhee and Collette 2002a). Potential impacts to habitat from otter trawls, scallop dredges and clam dredges include knocking down boulder piles, removing biogenic structure and filling in bottom depressions, which may disturb nests and/or leave these areas less suitable for nests. In addition, fishing may frighten parents from nests leaving eggs susceptible to predation. Egg EFH is therefore considered to have a high vulnerability to all bottom-tending mobile gear.

Ocean pout have a relatively short larval stage, and in fact some authors (Klein-MacPhee and Collette 2002a) suggest that there is no larval stage (Steimle et al. 1999e). Since the NEFMC designated EFH for this life stage, it is considered here. Larvae (hatchlings) remain near the nest site; however, there is little information on their use of habitats. Larvae do not appear to be as closely associated with the bottom as eggs or juveniles; however, it is anticipated that loss of structure may impact larvae to some degree. Larval EFH was determined to have high vulnerability to mobile bottom-tending gears.

Juvenile pout are found under rocks, shells and algae, in coastal waters and are closely associated with the bottom (Steimle et al. 1999e). They feed on benthic invertebrates such as gammarid amphipods and polychaetes. It is expected that loss of structure may be a fairly significant impact to juvenile EFH. Vulnerability of juvenile EFH to all mobile gear was considered to be high.

Adult pout are found in sand and gravel in winter and spring, and in rocky/hard substrate areas for spawning and nesting (Klein-MacPhee and Collette 2002a). They create burrows in soft sediments, and their diet consists mainly of benthic invertebrates including mollusks, crustaceans and echinoderms. Because of the strong benthic affinity of ocean pout, it is anticipated that vulnerability of adult EFH to all mobile gear is high.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 414 - Ocean Pout EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Outer continental shelf of GB and southern NE south to Cape Hatteras, North Carolina	<1250	Observed all year and primarily collected at depths from 110 - 270m	Pelagic waters	NA	NA	NA	NA	NA
Larvae	Outer continental shelf of GB and southern NE south to Chesapeake Bay	<1250	Observed all year and primarily collected at depths from 70 - 130m	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	Outer continental shelf of GB and southern NE south to Cape Hatteras, NC	170-350		Bottom habitats	L	L	0	L	L
Adults	Outer continental shelf of GB and southern NE south to Cape Hatteras, NC	150 - 380		Bottom habitats	L	L	0	L	L
Spawning Adults	Outer continental shelf of GB and southern NE south to the Middle Atlantic Bight	330 - 550	Spawn throughout the year	Bottom habitats	L	L	0	L	L

Rationale: Offshore hake (Merluccius albidus**),** are distributed over the continental shelf and slope of the northwest Atlantic, ranging from the Grand Banks south to the Caribbean and Gulf of Mexico (Chang et al. 1999a, Klein-MacPhee 2002c). Juveniles and adults are found in deeper waters, and are most abundant at depths between 150 - 380 m. They are an important component in the slope community off Florida, and are reportedly caught near the outer edge of the Scotian shelf, and on the slopes of deep basins in the Gulf of Maine and the continental slope from the southeastern edge of Georges Bank south. Because of their depth preference, very little is known about the offshore component of the stock. Moreover, offshore hake are similar in appearance to silver hake, and may have been misidentified in earlier studies. They are taken commercially as by-catch in the silver hake fishery. No information is available on substrate preferences for juveniles and adults. Eggs and larvae are pelagic, and EFH vulnerability to fishing gears is not applicable.

Juvenile and adult offshore hake appear to feed at or near the bottom, and are primarily piscivorous (feeding particularly on clupeids, anchovies, and lanternfishes) but they also eat crustaceans and squid (Klein-MacPhee 2002c). There is evidence of adult diel vertical migration. Only limited information exists about this species, and none of it indicates that offshore hake have a very strong bottom affinity, or that impacts from fishing gear would affect the functional value of their habitat. Although spawning occurs near the bottom, the actual use of benthic habitat during spawning is unknown. The vulnerability of adult and juvenile EFH to otter trawls and scallop dredges is expected to be low. Vulnerability to clam dredges is rated as none since the gear does not operate in the EFH of this species.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 415 - Offshore Hake EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB and the following estuaries: Great Bay to Boston Harbor	30-270	October to June, peaks Nov. to Feb.	Pelagic waters	NA	NA	NA	NA	NA
Larvae	GOME, GB and the following estuaries: Passamaquoddy Bay, Sheepscot R., Great Bay to Cape Cod Bay	10-250	September to July, peaks Dec. to Feb.	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	GOME, GB and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay to Waquoit Bay; Long Island Sound, Great South Bay	0 - 250		Bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks	L	L	L	L	L
Adults	GOME, GB, southern NE, and middle Atlantic south to New Jersey and the following estuaries: Passamaquoddy Bay, Damariscotta R., Mass Bay, Cape Cod Bay, Long Island Sound	15-365		Hard bottom habitats including artificial reefs	M	M	L	L	L
Spawning Adults	GOME, southern NE, and middle Atlantic south to New Jersey includes Mass Bay	15-365	September to April, peaks Dec. to Feb.	Bottom habitats with a substrate of hard, stony, or rocky bottom includes artificial reefs	M	M	L	L	L

Rationale: Pollock (Pollachius virens**)** range from the Hudson straits to North Carolina (Klein-MacPhee 2002b), and are most common on the Scotian Shelf, Georges Bank, the Great South Channel and Gulf of Maine (Cargnelli et al. 1999d). They segregate into schools by size, and avoid water warmer than about 15?C (Klein-MacPhee 2002b). They are active fish that live at any depth between the bottom and the surface, depending upon food supply. They are associated with coastal areas and offshore shoals, and are found from shore out to depths of about 325 m, but are most common from 75-175 m (Cargnelli et al. 1999d). Juveniles frequently occupy the rocky intertidal zone, which may serve as a nursery area (Klein-MacPhee 2002c). Neither adults nor juveniles are selective in substrate type.

Pollock are opportunistic, and the diet of both juveniles and adults consists mainly of euphausiid crustaceans, but fish, other crustaceans and squid are also eaten (Cargnelli et al. 1999d, Klein-MacPhee 2002c). Adults spawn over broken bottom and the slopes of offshore banks, and eggs are pelagic. Based on food habits, and the distribution and behavior of pollock, vulnerability of juvenile EFH to benthic mobile gear is characterized as low. Since pollock spawn on the bottom, the vulnerability of adult EFH to otter trawls and scallop dredges has been rated as moderate. EFH vulnerability from clam dredges has been rated as low for juveniles and adults since there is limited use of this gear in pollock EFH. Pollock eggs and larvae are pelagic, so EFH vulnerability to fishing gear is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 416 - Pollock EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras		May to November, peaks in June and July	Surface waters of inner continental shelf	NA	NA	NA	NA	NA
Larvae	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and following estuaries: Sheepscot R., Mass Bay to Cape Cod Bay; Buzzards Bay, Narragansett Bay & Hudson R./ Raritan Bay	<200	May to December, peaks in Sept. and Oct.	Surface waters	NA	NA	NA	NA	NA
Juveniles	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay, Mass Bay to Cape Cod Bay; Buzzards Bay to Conn. R.; Hudson R./ Raritan Bay, & Chesapeake Bay	<100		Bottom habitats with substrate of shell fragments, including areas with an abundance of live scallops	H	H	H	L	L
Adults	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay, Mass Bay to Cape Cod Bay; Buzzards Bay to Conn. R.; Hudson R./ Raritan, Delaware Bay, & Chesapeake Bay	10-130		Bottom habitats in depressions with a substrate of sand and mud	M	M	L	L	L

Table 417 - Red Hake EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Spawning Adults	GOME, southern edge of GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and following estuaries: Sheepscott R., Mass Bay, Cape Cod Bay, Buzzards Bay, & Narragansett Bay	<100	May to November, peaks in June and July	Bottom habitats in depressions with a substrate of sand and mud	M	M	L	L	L

Rationale: Red hake (Urophycis chuss) is a demersal species that ranges from southern Newfoundland to North Carolina, and is most abundant between Georges Bank and New Jersey (Steimle et al. 1999d). They occur at depths between 35 - 980 m, and are most common between 72 - 124 m (Klein-MacPhee 2002b). Larvae, juveniles, and adults have been found in estuaries from Maine south to Chesapeake Bay (NEFMC 1998). Eggs and larvae are pelagic, and EFH vulnerability to bottom-tending fishing gear is not applicable.

Juvenile red hake are found in live Atlantic sea scallops or empty scallop shells, and are also associated with other objects such as other shells, sponges, and rocks (Klein-MacPhee 2002b). Shelter appears to be a critical habitat requirement for this life stage (Able and Fahay 1998), and physical complexity, including biogenic structure other than scallop shells, may be important (Auster et al. 1991, 1995). Their diet consists mainly of amphipods and other infauna and epifauna. Juvenile hake EFH is considered to be highly vulnerable to all three mobile gear groups.

Adult red hake feed mainly on euphausiids, and also consume other invertebrates and fish (Klein-MacPhee 2002b). They are found mainly on soft bottoms (sand and mud) where they create depressions or use existing depressions. They are also found on shell beds, but not on open, sandy bottom. Otter trawls and scallop dredges operate in these soft bottom and shell bed areas and have been shown to affect the structural components of these habitats. Offshore in Maryland and northern Virginia, adult red hake are found on temperate reefs and hard bottom areas. There is a potential that otter trawls could operate in hard bottom areas and adversely affect the functional value of these reef habitats. Vulnerability of red hake EFH to otter trawls and scallop dredges is assessed as moderate. Clam dredges would not typically operate in these hard bottom areas, nor in the softer sediments with which red hake are usually associated in the northern extent of their range, but there is some overlap between adult EFH and clam dredge use in sandy habitats. EFH vulnerability to clam dredges is characterized as low.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.

Table 417 - Red Hake EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Viviparous (eggs are retained in mother, released as larvae)				NA	NA	NA	NA	NA
Larvae	GOME, southern GB	50-270	March to October, peak in August	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	GOME, southern edge of GB	25-400		Bottom habitats with a substrate of silt, mud, or hard bottom	H	H	0	L	L
Adults	GOME, southern edge of GB	50-350		Bottom habitats with a substrate of silt, mud, or hard bottom	M	M	0	L	L
Spawning Adults	GOME, southern edge of GB	5 -350	April to August	Bottom habitats with a substrate of silt, mud, or hard bottom	M	M	0	L	L

Rationale: Redfish (Sebastes spp.) include both the Acadian redfish (Sebastes fasciatus) and the deepwater redfish (Sebastes mentella). These two species are difficult to discriminate at all life stages, hence they are usually combined (Pikanowski et al. 1999). Acadian redfish range from Iceland to New Jersey, and deepwater redfish occur from the Gulf of Maine north. Where the species overlap, the deepwater redfish occurs in deeper water. They range in depth from 25 - 592 m (Klein-MacPhee and Collette 2002b), with adults most common from 125 - 200 m and juveniles between 75 and 175 m (Pikanowski et al. 1999). In general, information about redfish is very limited. Females bear live young and larvae are pelagic, so habitat vulnerability is not applicable to eggs or larvae.

Redfish are found chiefly on silt, mud or hard bottom and rarely over sand (Pikanowski et al. 1999). On the Scotian shelf they are strongly associated with fine-grained clay/silt bottom (Klein-MacPhee and Collette 2002b), as well as deposits of gravel and boulders (Pikanowski et al. 1999). It is hypothesized that redfish do not prefer a particular bottom type, but may be more exposed to predation over a featureless bottom due to their sedentary nature. There is limited evidence that juveniles use anemones and boulders for cover (Pikanowski et al. 1999). Early demersal phase Acadian redfish have been observed to occur primarily in piled boulder habitats while late-juvenile redfish occur in both piled boulder, gravel and dense cerianthid anemone habitats (Auster et al., in prep.). Habitat vulnerability from otter trawls and scallop dredges in boulder habitats is high as gear can overturn boulders and reduce the number of crevices as well as dislodge cerianthid anemones from the bottom.

Redfish are benthic during the day, and become more active at night when they rise off the bottom, following the vertical migration of their primary euphausiid prey (Pikanowski et al. 1999). They also eat some benthic fish. Adult EFH was determined to be moderately vulnerable to impacts from otter trawls and scallop dredges. Clam dredges do not operate in areas of redfish EFH so vulnerability was rated as none.

Definitions : GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 418 - Redfish EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, southern NE and the following estuaries: Great Bay to Cape Cod Bay		August to September	Surface waters	NA	NA	NA	NA	NA
Larvae	GOME, southern edge of GB, southern NE to middle Atlantic and the following estuaries: Mass Bay, to Cape Cod Bay		May in mid-Atlantic area, Aug. & Sept. in GOME, GB area	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	GOME, southern edge of GB, southern NE to middle Atlantic and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Cape Cod Bay	5 - 225	May-September	Pelagic stage - pelagic waters; Demersal stage - Bottom habitat with seagrass beds or substrate of mud or fine-grained sand	M	M	0	L	L
Adults	GOME, southern edge of GB, southern NE to middle Atlantic and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Cape Cod Bay	5 - 325		Bottom habitats with substrate of mud or fine-grained sand	L	L	0	L	L

Table 419 - White Hake EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Spawning Adults	GOME, southern edge of GB, southern NE to middle Atlantic	5 - 325	April to May - southern part of range; August - Sept.- northern part of range	Bottom habitats with substrate of mud or fine-grained sand in deep water	L	L	0	L	L

Rationale: White hake (Urophycis tenuis**)** adults co-occur geographically with red hake, and their habits are similar, but white hake are distributed in a wider range of depths and temperatures (Chang et al. 1999c, Klein-MacPhee 2002b). They are found from Labrador south to North Carolina, and occasionally stray as far as Florida and Iceland. They inhabit coastal estuaries and occur across the continental shelf to the submarine canyons along the upper continental shelf, and in the basins of the Gulf of Maine. Adult distribution in the region is focused in the Gulf of Maine and along the southern slope of Georges Bank. All life stages are found in estuaries in the vicinity of the Gulf of Maine (NEFMC 1998).

Most pelagic juveniles cross the shelf and enter estuaries from Canada south to the Mid-Atlantic, although some may also settle to the bottom in as yet unknown shelf habitats (Klein-MacPhee 2002b). Demersal juveniles are found in nearshore waters out to a depth of about 225 m (Chang *et al*. 1999c). Eelgrass is an important habitat for juveniles, but its functional importance is unknown; this life stage is not necessarily dependent upon structure (Able and Fahay 1998). Young-of-the-year white hake feed mainly on shrimp, mysids and amphipods. Since otter trawls and scallop dredges can negatively impact eelgrass (Stephan *et al.* 2000) in estuaries, vulnerability of juvenile white hake EFH to these gears is characterized as moderate. Hydraulic clam dredges are not utilized in estuaries of the Gulf of Maine so vulnerability to this gear is rated as none.

Adults prefer benthic deposits of fine grained sediments (Chang et al. 1999c). They feed primarily on fish, cephalopods, and crustaceans. Since they are not benthivores and have not been documented to use benthic habitats for cover, EFH vulnerability to otter trawls and scallop dredges is characterized as low. Clam dredges are not operated in areas of adult EFH and vulnerability to this gear is rated as none.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 419 - White Hake EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Merrimack R. to Cape Cod Bay	50-150	All year, peaks June to October	Surface waters	NA	NA	NA	NA	NA
Larvae	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Mass Bay to Cape Cod Bay	50-130	All year, peaks July to September	Surface waters	NA	NA	NA	NA	NA
Juveniles	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Casco Bay, Mass Bay to Cape Cod Bay	20-270		Bottom habitats of all substrate types	M	M	M	L	L
Adult	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Casco Bay, Mass Bay to Cape Cod Bay	30-325		Bottom habitats of all substrate types	L	L	L	L	L
Spawning Adults	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Mass Bay and Cape Cod Bay	30-325		Bottom habitats of all substrate types	L	L	L	L	L

Rationale: Whiting or silver hake (Merluccius bilinearis**)** range from Newfoundland south to Cape Fear, NC, and are most common from Nova Scotia to New Jersey (Morse et al. 1999). They are distributed broadly, and are found from nearshore shallows out to a depth of 400 m (Klein-MacPhee 2002c). All life stages have been found in estuaries from Maine to Cape Cod Bay (Morse et al. 1999). The vertical movement of offshore hake is governed chiefly by their pursuit of prey; both juveniles and adults show a vertical migration off the bottom at night when feeding activity is greatest.

In the Mid-Atlantic Bight, juvenile whiting have been found in greater densities in areas with greater amphipod tube cover (Auster et al. 1997). Further, silver hake size distributions in sand wave habitats are positively correlated with sand wave period (i.e., the spacing between sand waves), suggesting energetic or prey capture benefits in particular sand wave environments (Auster et al in press). Juveniles are primarily found on silt or sand substrate and feed mainly on crustaceans, including copepods, amphipods, euphausiids, and decapods (Morse et al. 1999). The vulnerability of juvenile EFH to mobile gear was rated as moderate because of the potential connection between structure and habitat suitability for this life stage.

Adult whiting rest on the bottom in depressions by day, primarily over sand and pebble bottoms, and rarely in rockier areas. In the Mid-Atlantic, adults were found on flat sand, sand wave crests, shell, and biogenic depressions, but were most often found on flat sand. At night, adults feed on anchovies, herring, lanternfish, and other fishes (Klein-MacPhee 2002c). Piscivory increases with size for this species. Vulnerability of adult whiting EFH to the three mobile gear types was rated as low because of whiting=s piscivorous food habits and preference for higher energy sand environments which recover quickly from fishing gear impacts (see Section 5). Eggs and larvae of this species are pelagic, so habitat vulnerability to fishing gear is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT- Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 420 - Silver Hake EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Delaware Inland Bays	<70	February to November, peaks May and October in middle Atlantic July - August on GB	Surface waters	NA	NA	NA	NA	NA
Larvae	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Delaware Inland Bays	<70	February to November, peaks May and October in middle Atlantic July - August on GB	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Chesapeake Bay	1 - 100		Bottom habitats with substrate of mud or fine grained sand	L	L	L	L	L
Adults	GOME, GB, southern NE, middle Atlantic south to Virginia - NC border and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Chesapeake Bay	1 - 75		ottom habitats with substrate of mud or fine grained sand	L	L	L	L	L
Spawning Adults	GOME, GB, southern NE, middle Atlantic south to Virginia -NC border and the following estuaries: Passamaquoddy Bay to Great Bay; Mass Bay to Delaware Inland Bays	1 - 75	February - December, peak in May in middle Atlantic	Bottom habitats with substrate of mud or fine grained sand	L	L	L	L	L

Rationale: Windowpane flounder (Scophthalmus aquosus**)** is distributed in coastal waters from the Gulf of St. Lawrence to Florida, and are most abundant on Georges Bank and in the New York Bight (Klein-MacPhee 2002d). Windowpane are abundant in estuaries from Maine through the Chesapeake Bay (NEFMC 1998). They are a shoal-water fish, with a depth range of up to 200 m, but are most abundant in waters less than 50 m deep. Both juveniles and adults are found on muddy sediments in the Gulf of Maine, and fine, sandy sediments on Georges Bank and in New England and the Mid-Atlantic Bight.
Mysids are the main prey item of juveniles (Klein-MacPhee 2002d). Adults have been shown to feed exclusively on nekton and show little need for bottom structure (Chang et al. 1999b). EFH vulnerability to the three types of mobile gear was rated as low for both these life stages. Windowpane eggs and larvae are pelagic, so EFH vulnerability to fishing gear is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 421 - Windowpane Flounder EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					CT	SD	CD	PT	NL
Eggs	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Delaware Inland Bays	<5	February to June, peak in April on GB	Bottom habitats with a substrate of sand, muddy sand, mud, and gravel	L	L	L	L	L
Larvae	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Delaware Inland Bays	<6	March to July, peak in April and May on GB	Pelagic and bottom waters	L	L	L	L	L
Juveniles	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Chincoteague Bay	0.1 - 10 (1 – 50, age 1+)		Bottom habitats with a substrate of mud or fine grained sand	L	L	L	L	L
Adults	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Chincoteague Bay	1 - 100		Bottom habitats including estuaries with substrate of mud, sand, gravel	M	M	M	L	L
Spawning Adults	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Delaware Inland Bays	<6	February to June	Bottom habitats including estuaries with substrate of mud, sand, gravel	M	M	M	L	L

Rationale: Winter flounder (Pseudopleuronectes americanus**)** range from Labrador to Georgia, and are most abundant from the Gulf of St. Lawrence to Chesapeake Bay (Klein-MacPhee 2002a). All lifestages are common in estuaries from Maine through Chesapeake Bay. Juveniles and adults are found in waters less than 100 m deep, and most are found from shore to 30 m. They range far upstream in estuaries, and have been found in freshwater.

Winter flounder lay demersal adhesive eggs in shallow water less than 5 m in depth, with the exception of spawning areas on Georges Bank and Nantucket shoals (Pereira et al. 1999). Substrates include sand, muddy sand, mud and gravel, with sand the most common. Although otter trawls, scallop dredges and clam dredges may affect the eggs directly, this was not considered a habitat impact. Since there is no indication that the eggs rely on any structure, egg EFH vulnerability to these three gears was rated as low. Since early stage larvae are associated with the bottom and are at times demersal (Able and Fahay 1998) larval EFH vulnerability to all gears were also rated as low instead of none.

Juvenile and adult winter flounder are found on mud and sand substrates, and adults are also seen on cobble, rocks and boulders (Pereira et al. 1999). Both life stages can be opportunistic feeders, however their main prey items are infaunal invertebrates. Because of their reliance on infauna and their ability to use alternative food supplies, EFH vulnerability to the three mobile gear types for these the adults stages was ranked as moderate.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 422 - Winter Flounder EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras	Deep	March to October	Surface waters	NA	NA	NA	NA	NA
Larvae	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras	Deep	March to November, peaks in May - July	Surface waters	NA	NA	NA	NA	NA
Juveniles	GOME, outer continental shelf from GB south to Cape Hatteras	50-450 to 1500		Bottom habitats with fine-grained substrate	M	L	0	L	L
Adults	GOME, outer continental shelf from GB south to Chesapeake Bay	25-300		Bottom habitats with fine-grained substrate	M	L	L	L	L
Spawning Adults	GOME, outer continental shelf from GB south to Chesapeake Bay	25-360	March to November, peaks in May-August	Bottom habitats with fine-grained substrate	M	L	L	L	L

Rationale: Witch flounder (Glyptocephalus cynoglossus) range from Newfoundland south to Cape Hatteras. In U.S. waters, this species is common throughout the Gulf of Maine, and is found in deeper areas of and adjacent to Georges Bank and along the continental shelf edge and upper slope (Cargnelli et al 1999e, Klein-MacPhee 2002a).

Juvenile and adult witch flounder are found mainly over fine muddy sand, or mud. Though their diet is comprised mainly of polychaetes, they feed on other invertebrates as well (Cargnelli et al. 1999e). Since these life stages occur in areas of lower natural disturbance and rely on infauna, EFH vulnerability to impacts from otter trawls were rated as moderate. Impacts from scallop dredging may be less severe, since scallop dredges are not usually used in muddy habitat; however, vessel trip reports indicated scallop dredging in areas of witch flounder EFH, therefore, vulnerability to scallop dredges was rates as low. Juvenile EFH vulnerability to clam dredges was rated as none since clam dredges are not used in mud or in water depths where juvenile witch flounder are primarily found. However, EFH vulnerability to clam dredges for adults was rated as low since clam dredges do operate in adult EFH. Eggs and larvae of witch flounder are pelagic, so vulnerability of EFH to fishing gear impacts is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 423 - Witch Flounder EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GB, Mass Bay, Cape Cod Bay, southern NE continental shelf south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay to Cape Cod Bay	30 - 90	Mid-March to July, peaks in April to June in southern NE	Surface waters	NA	NA	NA	NA	NA
Larvae	GB, Mass Bay, Cape Cod Bay, southern NE continental shelf, middle Atlantic south to Chesapeake Bay and the following estuaries: Passamaquoddy Bay to Cape Cod Bay	10 - 90	March to April in New York bight; May to July in south NE and southeastern GB	Surface waters	NA	NA	NA	NA	NA
Juveniles	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Sheepscot R., Casco Bay, Mass Bay to Cape Cod Bay	20 - 50		Bottom habitats with substrate of sand or sand and mud	M	M	M	L	L
Adults	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Sheepscot R., Casco Bay, Mass Bay to Cape Cod Bay	20 - 50		Bottom habitats with substrate of sand or sand and mud	M	M	M	L	L
Spawning Adults	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Mass Bay to Cape Cod Bay	10-125		Bottom habitats with substrate of sand or sand and mud	M	M	M	L	L

Rationale: Yellowtail flounder (Limanda ferruginea) are found from the Gulf of St. Lawrence south to the Chesapeake Bay (Klein-MacPhee 2002a, Johnson et al. 1999). They are most abundant on the western half of Georges Bank, western Gulf of Maine, east of Cape Cod, and off southern New England (Johnson et al. 1999). Their usual depth range is from 10 - 100 m (Klein MacPhee 2002a). Juveniles and adults are found in some New England estuaries while eggs and larvae are found more frequently in these habitats (NEFMC 1998). Yellowtail eggs and larvae are pelagic, so EFH vulnerability is not applicable.

Yellowtail flounder feed mainly on benthic macrofauna, primarily amphipods and polychaetes (Johnson et al. 1999). Adults eat mostly crustaceans while juveniles focus on polychaetes. Both life stages are found on substrates of sand or sand and mud. Vulnerability of juvenile and adult EFH to the three types of mobile gear was rated as moderate because of the potential affect of these gears on infaunal yellowtail prey.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT- Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0- No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 424 - Yellowtail Flounder EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Southern flank of GB and south the Cape Hatteras, NC	200-400		Attached to the underside of the female crab until hatched - see spawning adults	NA	NA	NA	NA	NA
Larvae	Southern flank of GB and south the Cape Hatteras, NC	200-1800	January - June	Water column from surface to seafloor	NA	NA	NA	NA	NA
Juveniles	Southern flank of GB and south the Cape Hatteras, NC	700-1800		Bottom habitats of continental slope with a substrate of silts, clays, and all silt-clay-sand composites	L	0	0	L	L
Adults	Southern flank of GB and south the Cape Hatteras, NC	200-1300		Bottom habitats of continental slope with a substrate of silts, clays, and all silt-clay-sand composites	L	0	0	L	L
Spawning Adults	Southern flank of GB and south the Cape Hatteras, NC	200-1300		Bottom habitats of continental slope with a substrate of silts, clays, and all silt-clay-sand composites	L	0	0	L	L

Rationale: Red crab **(**Chaeceon (Geryon) quinquedens**)** are found on the outer continental shelf and slope of the western Atlantic from Nova Scotia into the Gulf of Mexico (Steimle et al. 2001). They are found on the bottom, chiefly between water depths of 200 and 1800. EFH depth range for juveniles is from 700 to 1800 m, and for adults EFH ranges from 200-1300 m. They are found on substrates ranging from silt and clay to hard substrates.

Red crab are opportunistic benthic feeders/scavengers, with a diet of epifauna and other opportunistically available items (Steimle et al. 2001). Post-larval juveniles feed on a wide variety of infaunal and epifaunal benthic invertebrates. Small crabs eat sponges, hydroids, gastropods and other organisms. Larger crabs eat similar small benthic fauna and larger prey including demersal and mid-water fishes.

The only fishery using mobile bottom gear which operates in red crab EFH is the monkfish trawl fishery (NEFMC 2002). The vulnerability of adult and juvenile red crab EFH to otter trawls was characterized as low because of their opportunistic feeding habits. Vulnerability to scallop dredges and clam dredges was rated as none since those gears do not operate in red crab EFH. Larval red crabs are pelagic and EFH vulnerability is not applicable. The "habitat" for eggs is the female carapace, therefore EFH vulnerability for this life stage is also not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT- Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 425 - Red Crab EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Continental shelf from Maine through Cape Hatteras, NC also includes estuaries from Great Bay to Cape Cod Bay; Buzzards Bay to Long Island Sound; Gardiners Bay and Great South Bay	0 - 15		Pelagic waters	NA	NA	NA	NA	NA
Larvae	Continental shelf from GOME through Cape Hatteras, NC also includes estuaries from Great Bay to Cape Cod Bay; Narragansett Bay to Long Island Sound; Gardiners Bay and Great South Bay	10-130		Pelagic waters	NA	NA	NA	NA	NA
Juveniles	Continental shelf from GOME through Cape Hatteras, NC also includes estuaries from Passamaquoddy Bay; Penobscot Bay to Saco Bay; Great Bay; Mass Bay to Cape Cod Bay; Narragansett Bay, Long Island Bay; Gardiners Bay to Hudson R./ Raritan Bay	0 - 320		Pelagic waters	NA	NA	NA	NA	NA
Adults	Continental shelf from GOME through Cape Hatteras, NC also includes estuaries from Passamaquoddy Bay to Saco Bay; Mass Bay to Long Island Bay; Gardiners Bay to Hudson R./ Raritan Bay	0 - 380		Pelagic waters	NA	NA	NA	NA	NA

Rationale: All life stages of Atlantic mackerel (Scomber scombrus**)** are pelagic, so their EFH is not vulnerable to bottom tending fishing gear, and vulnerability was categorized as Anot applicable.@

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT- Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 426 - Atlantic Mackerel EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Continental shelf and estuaries from southern NE to North Carolina, also includes Buzzards Bay	0 - 200	May to October	Water column of coastal Mid-Atlantic Bight and Buzzards Bay	NA	NA	NA	NA	NA
Larvae	Pelagic waters over continental shelf from GOME to Cape Hatteras, NC, also includes Buzzards Bay	<100	May - November, peak June - July	Habitats for transforming (to juveniles) larvae are near coastal areas and into marine parts of estuaries between Virginia and NY; when larvae become demersal, found on structured inshore habitat such as sponge beds	H	H	H	L	L
Juveniles	Demersal waters over continental shelf from GOME to Cape Hatteras, NC, also includes estuaries from Buzzards Bay to Long Island Sound; Gardiners Bay, Barnegat Bay to Chesapeake Bay; Tangier/ Pocomoke Sound and James River	1 - 38	Found in coastal areas (April – Dec. , peak June – Nov.) between VA and MA, but winter offshore from NJ and south; estuaries in summer and spring	Rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas, offshore clam beds and shell patches may be used during wintering	H	H	H	L	L

Table 427 - Black Sea Bass EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Adults	Demersal waters over continental shelf from GOME to Cape Hatteras, NC, also includes estuaries: Buzzards Bay, Narragansett Bay, Gardiners Bay, Great South Bay, Barnegat Bay to Chesapeake Bay; Tangier/ Pocomoke Sound and James River	20- 50	Wintering adults (Nov. to April) offshore, south of NY to NC; inshore, estuaries from May to October	Structured habitats (natural & man-made) sand and shell substrates preferred	H	H	H	L	L

Rationale: Black sea bass (Centropristis striata) are found in coastal waters of the northwest Atlantic, from Cape Cod south to Cape Canaveral (Klein-MacPhee 2002e). Occasionally they stray as far north as the Bay of Fundy (Gulf of Maine). Juveniles are common in high salinity estuaries. Adults and juveniles are found in estuaries from Massachusetts south to the James River, VA (Stone et al. 1994).

Black sea bass larvae are pelagic, but then become demersal and occupy structured inshore habitat such as sponge beds, eelgrass beds, shellfish beds, shell patches, and other rough bottoms (Steimle et al. 1999a) and offshore shell patches including clam beds (Able and Fahay 1998). The availability of structure limits successful postlarval and/or juvenile recruitment (Steimle et al. 1999a). Juveniles are diurnal visual predators that feed on benthic invertebrates and small fish. Adults are also structure oriented, and thought to use structure as shelter during day- time, but may stray off it to hunt at night.

Each of these life stages is associated with structure that may be vulnerable to fishing gear impacts, so vulnerability was rated as high for all mobile gear. It is important to note that structured habitats comprised of wrecks or other artificial reefs prone to damage by mobile gear may be avoided by fishermen. This is true of high relief natural areas as well. Black sea bass eggs are pelagic, so vulnerability to EFH is not applicable. Although larvae are pelagic, they do become demersal as they transition into juveniles. Therefore, larvae were rated the same as juveniles.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 427 - Black Sea Bass EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	North of Cape Hatteras, found over continental shelf from Montauk Point, NY south to Cape Hatteras, South of Cape Hatteras, found over Continental shelf through Key West, Florida	Mid-shelf depths	April to August	Pelagic waters	NA	NA	NA	NA	NA
Larvae	North of Cape Hatteras, found over continental shelf from Montauk Point, NY south to Cape Hatteras, South of Cape Hatteras, found over continental shelf through Key West, Florida, the slope sea and Gulf Stream between latitudes 29N and 40N; includes the following estuaries: Narragansett Bay	>15	April to September	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	North of Cape Hatteras, found over continental shelf from Nantucket Island, MA south to Cape Hatteras, South of Cape Hatteras, found over Continental shelf through Key West, Florida, the slope sea and Gulf Stream between latitudes 29N and 40N also includes estuaries between Penobscot Bay to Great Bay; Mass Bay to James R.; Albemarle Sound to St. Johns River, FL		North Atlantic estuaries from June to October, Mid-Atlantic estuaries from May toOctober, South Atlantic estuaries from March to December	Pelagic waters	NA	NA	NA	NA	NA
Adults	North of Cape Hatteras, found over continental shelf from Cape Cod Bay, MA south to Cape Hatteras, South of Cape Hatteras, found over Continental shelf through Key West, Florida also includes estuaries between Penobscot Bay to Great Bay; Mass Bay to James R.; Albemarle Sound to Pamilco/ Pungo R., Bougue Sound, Cape Fear R., St. Helena Sound, Broad R., St. Johns R., & Indian R.		North Atlantic estuaries from June to October, Mid-Atlantic estuaries from April to October, South Atlantic estuaries from May to January	Pelagic waters	NA	NA	NA	NA	NA

Rationale: All life stages of bluefish (Pomatomus saltatrix**)** are pelagic, so their EFH is not vulnerable to bottom tending fishing gear, and vulnerability was not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 428 - Bluefish EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Over continental shelf from GOME through Cape Hatteras, NC, also in estuaries from Mass Bay to Long Island Sound; Gardiners Bay, Great South Bay, and Chesapeake Bay	0-1829	Spring and summer	Pelagic waters	NA	NA	NA	NA	NA
Larvae	Over continental shelf from GOME through Cape Hatteras, NC, also in estuaries from Boston Harbor, Waquoit Bay to Long Island Sound; Gardiners Bay to Hudson R./ Raritan Bay; Delaware Bay and Chesapeake Bay	10-1829	Summer and fall	Pelagic waters	NA	NA	NA	NA	NA
Juveniles	Over continental shelf from GOME through Cape Hatteras, NC also in estuaries from Mass Bay, Cape Cod Bay to Delaware Inland Bays; Chesapeake Bay, York R. and James R.	10-365 (most <120)	Winter – shelf, spring to fall - estuaries	Pelagic waters (larger individuals found over sandy and muddy substrates)	NA	NA	NA	NA	NA
Adults	Over continental shelf from GOME through Cape Hatteras, NC, also in estuaries from Mass Bay, Cape Cod Bay to Hudson R./ Raritan Bay; Delaware Bay and Inland Bays; York R. and James R.	10-365 (most <120)	Winter – shelf, summer to fall - estuaries	Pelagic waters (schools form over sandy, sandy-silt and muddy substrates)	NA	NA	NA	NA	NA

Rationale: All life stages of butterfish (Peprilus triacanthus**)** are pelagic, so their EFH is not vulnerable to bottom tending fishing gear, and vulnerability was not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0- No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 429 - Butterfish EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	Over continental shelf from GOME through Cape Hatteras, NC	0 - 182	Carried northward by Gulf Stream	Pelagic waters	NA	NA	NA	NA	NA
Adults	Over continental shelf from GOME through Cape Hatteras, NC	0 - 182	Late fall - offshore, spawn Dec. - March	Pelagic waters	NA	NA	NA	NA	NA
Rationale: All stages of Ilex squid (Illex illecebrosus**)** are pelagic, so their EFH is not vulnerable to bottom tending fishing gear, and vulnerability was not applicable.									
Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**									

Table 430 - Illex Squid EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs***	Over continental shelf from GOME through Cape Hatteras, NC	<50	Spawn in May, hatch in July	Demersal egg masses are commonly found on sandy/mud bottom, usually attached to rocks/boulders, pilings or algae such as Fucus, Ulva, Laminaria, and Porphyra	H	H	H	L	L
Juveniles	Over continental shelf from GOME through Cape Hatteras, NC	0 - 213	Spring - fall - inshore winter - offshore	Pelagic waters	NA	NA	NA	NA	NA
Adults	Over continental shelf from GOME through Cape Hatteras, NC	0 - 305	March – Oct. – inshore, winter - offshore	Pelagic waters	NA	NA	NA	NA	NA
Rationale: Loligo or longfin squid (Loligo pealeii**)** is a pelagic schooling species. It is distributed in continental shelf and slope waters from Newfoundland to the Gulf of Venezuela (Cargnelli et al. 1999a). Most life stages of loligo squid are pelagic; however, encapsulated eggs are laid in masses, called Amops@ which are attached to structures such as rocks and algae on substrates of sand, mud, or hard bottom (Cargnelli et al. 1999a). ***As of this writing, EFH is not designated for Loligo eggs, however it will be designated in the near future. Once Loligo egg EFH is designated its EFH will be rated as highly vulnerable to otter trawls and scallop dredges, particularly since biogenic structures are used as attachment sites.									
Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**									

Table 431 - Loligo Squid EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	Eastern edge of GB and GOME throughout the Atlantic EEZ	8-245		Throughout substrate to a depth of 3ft within federal waters, occurs progressively further offshore between Cape Cod and Cape Hatteras	L	L	L	L	L
Adults	Eastern edge of GB and GOME throughout the Atlantic EEZ	8 - 245	Spawn May-Dec. with several peaks	Throughout substrate to a depth of 3ft within federal waters, occurs progressively further offshore between Cape Cod and Cape Hatteras	L	L	L	L	L

Rationale: Ocean quahog (Arctica islandica) juveniles are found in offshore sandy substrate, and may survive in muddy intertidal areas (Cargnelli et al. 1999b). Adults are found in similar offshore habitats, just below the surface of the sediment, usually in medium to fine-grained sand. Although clam dredges remove clams from the sediment, the habitat's functional value is probably not affected. Juvenile and adult EFH vulnerability was therefore rated as low for all mobile gears. Ocean quahog eggs and larvae are pelagic, therefore EFH vulnerability is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0- No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 432 - Ocean Quahog EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	Eastern edge of GB and the GOME throughout Atlantic EEZ	0 -60, low density beyond 38		Throughout substrate to a depth of 3 ft within federal waters, burrow in medium to coarse sand and gravel substrates, also found in silty to fine sand, but not in mud	L	L	L	L	L
Adults	Eastern edge of GB and the GOME throughout Atlantic EEZ	0 -60, low density beyond 38	Spawn-summer to fall	Throughout substrate to a depth of 3 ft within federal waters	L	L	L	L	L

Rationale: Atlantic surfclams (Spisula solidissima**)** are found in sandy continental shelf habitats from the southern Gulf of St. Lawrence to Cape Hatteras, North Carolina (Cargnelli et al. 1999c). They burrow into substrates from fine to coarse sandy gravel and are not found in mud. Although clam dredges remove clams from the sediment, the habitat's functional value is probably not affected. Juvenile and adult EFH vulnerability was therefore rated as low for all mobile gears. Surfclam eggs and larvae are pelagic, therefore EFH vulnerability is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 433 - Atlantic Surfclam EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Southern NE to coastal Virginia includes the following estuaries: Waquoit Bay to Long Island Sound; Gardiners Bay, Hudson R./ Raritan Bay	(<30)	May - August	Pelagic waters in estuaries	NA	NA	NA	NA	NA
Larvae	Southern NE to coastal Virginia includes the following estuaries: Waquoit Bay to Long Island Sound; Gardiners Bay, Hudson R./ Raritan Bay	(<20)	May - September	Pelagic waters in estuaries	NA	NA	NA	NA	NA
Juveniles	Continental shelf from GOME to Cape Hatteras, NC includes the following estuaries: Mass Bay, Cape Cod Bay to Long Island Sound; Gardiners Bay to Delaware Inland Bays; & Chesapeake Bay	(0 - 38)	Spring and summer in estuaries and bays	Demersal waters north of Cape Hatteras and Inshore on various sands, mud, mussel, and eelgrass bed type substrates	M	M	M	L	L
Adults	Continental shelf from GOME to Cape Hatteras, NC includes the following estuaries: Cape Cod Bay to Long Island Sound; Gardiners Bay to Hudson R./ Raritan Bay; Delaware Bay & Inland Bays; & Chesapeake Bay	(2 - 185)	Wintering adults (November - April) are usually offshore, south of NY to NC	demersal waters north of Cape Hatteras and Inshore estuaries (various substrate types)	L	L	L	L	L

Rationale: Scup (Stenotomus chrysops**)** is a temperate species that occurs primarily from Massachusetts to South Carolina, although it has been reported as far north as the Bay of Fundy and Sable Island Bank, Canada (Steimle et al. 1999f). Scup are primarily benthic feeders that use a variety of habitat types. Juveniles forage on epibenthic amphipods, other small crustaceans, polychaetes, mollusks, fish eggs, and larvae. They occur over a variety of substrates, and are most abundant in areas without structure. Limited observations of scup have shown periodic use of seafloor depressions for cover (Auster et al. 1991, 1995).
Adults are found on soft bottoms or near structures. During the summer they are closer inshore and found on a wider range of habitats. In the winter they congregate offshore in areas that are expected to serve as a thermal refuge (Klein-McPhee 2002f), particularly deeper waters of the outer continental shelf and around canyon heads. Smaller adults feed on echinoderms, annelids, and small crustaceans. Larger scup consume more squids and fishes. Since juvenile scup are primarily benthic feeders, their EFH was rated as moderately vulnerable to impacts from mobile bottom gear. EFH for adults was rated as low since there is less of a reliance on benthic prey items.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT- Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 434 - Scup EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	GOME through Cape Hatteras, NC across the Continental shelf; Continental shelf waters South of Cape Hatteras, NC through Florida; also includes estuaries from Passamaquaddy Bay to Saco Bay; Mass Bay & Cape Cod Bay	10-390		Continental shelf waters and estuaries	L	L	L	L	L
Adults	GOME through Cape Hatteras, NC across the Continental shelf; Continental shelf waters South of Cape Hatteras, NC through Florida; also includes estuaries from Passamaquaddy Bay to Saco Bay; Mass Bay & Cape Cod Bay	10-450		Continental shelf waters and estuaries	L	L	L	L	L

Rationale: Spiny dogfish (Squalus acanthias**)** is a coastal shark with a circumboreal distribution and is one of the most abundant sharks in the western North Atlantic (McMillan and Morse 1999). Female dogfish are viviparous, so EFH designations were limited to juveniles and adults. Smaller dogfish have been reported to feed primarily on crustaceans, with an increase in piscivory in larger individuals (Burgess 2002). Fish, mainly schooling pelagic species, constitute 50% of their diet. Their voracious and opportunistic feeding behavior was emphasized by McMillan and Morse (1999). Since neither of these life stages appears to be closely tied to benthic organisms, the vulnerability of their EFH to mobile gears was rated as low.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 435 - Spiny Dogfish EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	Over continental shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida	30-70 fall; 110 winter; 9-30 spring	October to May	Pelagic waters, heaviest concentrations within 9 miles of shore off NJ and NY	NA	NA	NA	NA	NA
Larvae	Over continental shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida; also includes estuaries from Waquoit Bay to Narragansett Bay; Hudson River/ Raritan Bay; Barnegat Bay, Chesapeake Bay, Rappahannock R., York R., James R., Albemarle Sound, Pamlico Sound, Neuse R. to Indian R.	10-70	Mid-Atlantic Bight from Sept. to Feb.; southern part from Nov. to May at depths of 9-30 m	Pelagic waters, larvae most abundant 19 - 83 km from shore, southern areas 12 - 52 miles from shore	NA	NA	NA	NA	NA
Juveniles	Over continental shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida; also includes estuaries from Waquoit Bay to James R.; Albemarle Sound to Indian R.	0.5-5 in estuary		Demersal waters, on muddy substrate but prefer mostly sand; found in the lower estuaries in flats, channels, salt marsh creeks, and eelgrass beds	M* * L	L	L	0	0

Table 436 - Summer Flounder EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
Adults	Over continental shelf from GOME to Cape Hatteras, NC; South of Cape Hatteras to Florida; also includes estuaries from Buzzards Bay, Narragansett Bay, Conn. R. to James R.; Albemarle Sound to Broad R.; St. Johns R., & Indian R.	0 - 25	Shallow coastal and estuarine waters during warmer months, move offshore on outer continental shelf at depths of 150m in colder months	Demersal waters and estuaries	M** L	L	L	0	0

Rationale: Summer flounder (Paralichthys dentatus**)** occur in the shallow estuarine waters and outer continental shelf from Nova Scotia to Florida with the center of their range located in the Middle Atlantic Bight (Packer et al. 1999b). Juvenile summer flounder are opportunistic feeders, and their diet includes mysids, fish, and some crustaceans (Packer et al. 1999b). There are gradual changes in the diet of summer flounder, with fish becoming more important as a food source as individuals get older and larger. Adults are also opportunistic feeders, with fish and crustaceans making up a significant portion of their diet.

Eelgrass and macroalgae has been designated as a habitat area of particular concern (HAPC) for adult and juvenile summer flounder. Stephan et al. (2000) determined that otter trawls could result in below-ground impacts to submerged aquatic vegetation (SAV), which, of all the impacts to SAV possible from fishing gear, was ranked as the impact of greatest concern. This determination was qualified by an acknowledgment that factors relevant to trawl use and the type of SAV species present, must be considered for a more precise evaluation of the effects of this gear type in SAV habitat. * *Based on potential impacts to SAV, the vulnerability of the summer flounder HAPC to otter trawls is rated as moderate. Vulnerability to scallop or clam dredges was considered low since these gears are not typically used in estuaries where SAV is found.

Since adults and juveniles are both opportunistic feeders, their EFH vulnerability (aside from the HAPC) was rated as low for all bottom tending gear. Summer flounder eggs and larvae are pelagic so EFH vulnerability is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 436 - Summer Flounder EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	US-Canadian Boundary to VA/NC boundary (shelf break; GB to Cape Hatteras)	76-365	Serial spawning March - November; peaks April – October	Water column	NA	NA	NA	NA	NA
Larvae	US-Canadian Boundary to VA/NC boundary (outer continental shelf - GB to Cape Hatteras)	76-365	Feb. - Oct; peaks July – October	Water column	NA	NA	NA	NA	NA
Juveniles	US-Canadian Boundary to VA/NC boundary (shelf break, submarine canyon walls and flanks - GB to Cape Hatteras)	76-365	All year - may leave GB in winter	Rough bottom, small burrows, and sheltered areas – Substrate rocky, stiff clay, human debris	H	L	0	L	L
Adults	US-Canadian Boundary to VA/NC boundary (shelf break, submarine canyon walls and flanks - GB to Cape Hatteras)	76-365	All year - may leave GB in winter	Rough bottom, small burrows, and sheltered areas – Substrate rocky, stiff clay, human debris	H	L	0	L	L

Rationale: Tilefish (Lopholatilus chamaeleontieps**)** are restricted to the continental shelf break south of the Gulf of Maine (Steimle et al. 1999b). They occupy a number of habitats, including scour basins around rocks or other rough bottom areas that form burrow-like cavities, and pueblo habitats in clay substrate. The dominant habitat type is a vertical burrow in a substrate of semi-hard silt/clay, 2 - 3 m deep and 4 - 5 m in diameter with a funnel shape. These burrows are excavated by tilefish, and then secondary burrows are created by other organisms, including lobsters, conger eels, and galatheid crabs. Tilefish are visual daytime feeders on galatheid crabs, mollusks, shrimps, polychaetes and occasionally fish. Mollusks and echinoderms are more important to smaller tilefish. Little is known about juveniles of the species.

A report to the Mid-Atlantic Fishery Management Council (Able and Muzeni 2002) from a video survey in areas of tilefish habitat identified trawl tracks through these areas, and concluded that trawling caused a re-suspension of bottom sediments. The report noted that re-suspended sediments fill burrows in and/or cause physiological stress to tilefish that are present. No obvious structural impacts to the habitat were identified. However, due to the tilefish's reliance on structured shelter and the need for further study, the vulnerability of tilefish EFH to otter trawls was ranked as high. Clam dredges operate in shallow, sandy waters typically uninhabited by tilefish, so EFH vulnerability was rated as none for this gear. Scallop vessel monitoring data (Section 4) indicate that scallop dredges operate to a small extent in areas overlapping tilefish EFH, therefore EFH vulnerability to scallop dredges was ranked as low. Tilefish eggs and larvae are pelagic, therefore EFH vulnerability is not applicable.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 437 - Tilefish EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Larvae	Along the Atlantic coast from Virginia through the Florida Keys	<50		Estuarine wetlands especially important (flooded saltmarshes, brackish marsh, tidal creeks, mangrove fringe, seagrasses)	NA	NA	NA	NA	NA
Juveniles	Along the Atlantic coast from Virginia through the Florida Keys	<50	Found throughout Chesapeake Bay from Sept. - Nov.	Utilize shallow backwaters of estuaries as nursery areas and remain until they move to deeper water portions of the estuary associated with river mouths, oyster bars and front beaches	L	0	0	L	L

Table 438 - Red Drum EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Adults	Along the Atlantic coast from Virginia through the Florida Keys	<50	Found in Chesapeake in spring and fall and also along eastern shore of VA	Concentrate around inlets, shoals, and capes along the Atlantic coast – shallow bay bottoms or oyster reef substrate preferred, also nearshore artificial reefs	L	L	L	L	L
Rationale: Red drum (Sciaenops ocellatus**)** are distributed in estuarine and coastal waters depending upon their stage of maturity (McGurrin 1994). Juvenile red drum are found in shallow estuarine backwaters and as they grow they move to deeper areas. Submerged aquatic vegetation is particularly important habitat for juvenile drum. Sub-adult and adult red drum are found on estuarine bay bottoms or oyster reefs, and in nearshore coastal waters including the beach zone out to several miles from shore. Juvenile and adult red drum have a varied diet. Smaller juveniles eat copepods and mysids, while larger individuals eat decapods (crabs & shrimp), fish and plant material (McGurrin 1994). Although SAV is an important habitat for juvenile red drum, EFH vulnerability to otter trawls was rated as low since its use in SAV is limited. Scallop dredges and hydraulic clam dredges usually are not used in juvenile red drum EFH, therefore, EFH vulnerability for these gears was rated as none. Since red drum feed on a variety of organisms, and adults are found in many habitat types, vulnerability of adult EFH to mobile bottom gear was rated as low. Red drum eggs and larvae are pelagic therefore, EFH vulnerability is not applicable.									
Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**									

Table 438 - Red Drum EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Spanish Mackerel All Life Stages	South Atlantic and Mid-Atlantic Bights			Sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island ocean-side waters from surf zone to shelf break but from the Gulf Stream shoreward	NA	NA	NA	NA	NA
Cobia All Life Stages	South Atlantic and Mid-Atlantic Bights			Sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island ocean side waters from surf zone to shelf break but from the Gulf Stream shoreward, also high salinity bays, estuaries, seagrass habitat	NA	NA	NA	NA	NA

Table 439 - Spanish Mackerel, Cobia, and King Mackerel EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
King Mackerel All Life Stages	South Atlantic and Mid-Atlantic Bights			Sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island ocean-side waters from surf zone to shelf break but from the Gulf Stream shoreward	NA	NA	NA	NA	NA
Rationale: All life stages of Spanish mackerel (Scomberomorus maculatus), cobia (Rachycentron canadum) and King mackerel (Scomberomorus cavalla) are pelagic, so their EFH is not vulnerable to bottom tending fishing gear, and vulnerability was not applicable.									
Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**									

Table 439 - Spanish Mackerel, Cobia, and King Mackerel EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear(cont.)

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
All Life Stages	Chesapeake Bay to the south through the Florida Straight (and into the Gulf of Mexico)	290-570		Continental slope in flat areas of foraminifera ooze, on distinct mounds of dead coral, ripple habitat, dunes, black pebble habitat, low outcrop, and soft bioturbated habitat	L	0	0	L	L

Rationale: Golden crab (Chaceon fenneri) inhabit the continental slope of Bermuda and the southeastern United States from Chesapeake Bay south through the Florida Straight and into the Gulf of Mexico (SAFMC 1998). Although similar to red crab, less is known about this species. They are categorized as opportunistic scavengers, and are found in depths from 290 - 570 m on substrates of foraminiferon ooze, dead coral mounds, and deep ripple habitat, dunes, and black pebble habitat. Scallop dredges and clam dredges do not operate in golden crab EFH due to depth so EFH vulnerability was rated as none. Most otter trawling operates in depths less than 200 m so EFH vulnerability was rated as low for this gear type.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 440 - Golden Crab EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	Eastern GOME, GB, SNE, MAB to Hudson Canyon	0-750 mostly <150		Bottom habitats with mud, gravel, and sand substrates	M	M	L	L	L
Adults	Eastern GOME, GB, SNE, MAB to Hudson Canyon	0-750 mostly <150		Bottom habitats with mud, gravel, and sand substrates	M	M	L	L	L

Rationale: Barndoor skate (Dipturus laevis**)** occur from Newfoundland south to Cape Hatteras, but are most abundant on Georges Bank and in the Gulf of Maine. They are found on soft mud, sand and gravel. (Packer et al. in press (a)). Barndoor skate feed on invertebrates usually associated with the bottom - including polychaetes, gastropods, and bivalves - squid and fish. Smaller individuals feed primarily on polychaetes, copepods and amphipods while larger individuals capture larger and more active prey (McEachran 2002, Packer et al. in press (a)). A single fertilized egg is encapsulated in a leathery capsule known as a Amermaids purse.@ The young hatch in late spring or early summer and are thought to be about 180-190 mm in length, although very little information is available on this life stage (Packer et al. in press(a)).

Juvenile EFH was considered to be moderately vulnerable to otter trawls and scallop dredges because of the closer association of juveniles to a benthic invertebrate diet. Adult EFH vulnerability to otter trawls and scallop dredges was rated as moderate due primarily to their reproductive habits. EFH vulnerability to clam dredges was rated as low for juveniles and adults because this gear is not extensively used in EFH.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 441 - Barndoor Skate Pending EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	GOME, along shelf to Cape Hatteras, NC; includes the estuaries from Hudson River/Raritan Bay south to the Chesapeake Bay mainstem	0 - 500 mostly <111		Bottom habitats with substrate of soft bottom along continental shelf and rocky or gravelly bottom	M	M	M	L	L
Adults	GOME, along shelf to Cape Hatteras, NC; includes the estuaries from Hudson River/Raritan Bay south to the Chesapeake Bay mainstem	0 - 500 mostly <111		Bottom habitats with substrate of soft bottom along continental shelf and rocky or gravelly bottom	M	M	M	L	L

Rationale: Clearnose skate (Raja eglanteria**)** occur in the Gulf of Maine, but are most abundant from Cape Hatteras north to Delaware Bay. They are found over soft bottoms of mud and sand, and also occur on rocky or gravelly bottoms. They have been captured from shore out to depths of 330 m, but are most abundant at depths less than 111 m. (Packer et al. in press (b)). Adults and juveniles feed on polychaetes, amphipods, decapod crustaceans, mollusks, and fish. Like barndoor skates, crabs and benthic invertebrates are more important for smaller, younger individuals, and the importance of fish in the diet increases with age (McEachran 2002; Packer et al. in press(b)). A single fertilized egg is encapsulated in a leathery case. Eggs are deposited in the spring or summer and hatch 3 months later.

Juvenile EFH was considered to be moderately vulnerable to otter trawls, scallop dredges and clam dredges because of the closer association of juveniles to a benthic invertebrate diet. Adult EFH vulnerability to otter trawls, scallop dredges and clam dredges was rated as moderate due primarily to their reproductive habits.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 442 - Clearnose Skate Pending EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Eggs	GB through MAB to Cape Hatteras, NC; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	<27		Bottom habitats with sandy substrate	L	L	L	L	L
Juveniles	GB through MAB to Cape Hatteras, NC; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0-137 mostly 73-91		Bottom habitats with sandy or gravelly substrate or mud	M	M	M	L	L
Adults	GB through MAB to Cape Hatteras, NC; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0-137 mostly 73-91		Bottom habitats with sandy or gravelly substrate or mud	M	M	M	L	L

Rationale: Little skate (Leucoraja erinacea**)** range from Nova Scotia to Cape Hatteras, and are most abundant on Georges Bank and in coastal waters south to the mouth of Chesapeake Bay. They have been found at depths up to 500 m, but are most common at depths less than 111 m. In southern New England, juveniles and adults have been associated with microhabitat features including biogenic depressions and flat sand during the day (Auster et al. 1991, 1995). They are generally found on sandy or gravelly bottoms, but also occur on mud. They co-occur with winter skate, and are more active at night, although they appear to feed throughout the day and night. The most important prey are amphipods and decapod crustaceans, followed by polychaetes. Prey items of minor importance include bivalves, isopods, and fish. Similar to barndoor and clearnose skates, the use of fish as a food source increases with increasing size. Smaller skates eat more amphipods, and larger skate consume more decapod crustaceans (Packer et al. in press (c)).

A single fertilized egg is encapsulated in a leathery case which is deposited on sandy substrate. The cases have sticky filaments that adhere to bottom substrates. In one study, eggs deposited in the late spring and early summer required five to six months to hatch. Other studies have shown incubation to exceed one year. When the young hatch, they are considered juveniles and are fully developed, measuring from 93-102 mm in total length (Packer et al. in press (c)).

Vulnerability of juvenile EFH to mobile bottom gear was characterized as moderate because of the species dependence on benthic organisms in its diet. Vulnerability of adult EFH to mobile bottom gear was characterized as moderate due to its reproductive habits. Little skate is the only skate species in which EFH has been designated for eggs. Although bottom tending mobile gear may have adverse effects upon the eggs themselves, this was not considered to be a habitat impact. Since the bottom substrate appears to provide an attachment point for the eggs the EFH vulnerability to mobile gear was rated as low instead of none.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 443 - Little Skate Pending EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	Nantucket shoals and southern edge of GB to Cape Hatteras, NC	33-530 mostly 74-274		Bottom habitats with soft substrate, including sand/mud bottoms, mud with echinoid and ophiuroid fragments, and shell and pteropod ooze	M	M	M	L	L
Adults	Nantucket shoals and southern edge of GB to Cape Hatteras, NC	33-530 mostly 74-274		Bottom habitats with soft substrate, including sand/mud bottoms, mud with echinoid and ophiuroid fragments, and shell and pteropod ooze	M	M	M	L	L

Rationale: Rosette skate (Leucoraja garmani virginica) is a deeper water species that occurs along the outer shelf and continental slope from Nantucket Shoals to the Dry Tortugas, Florida. North of Cape Hatteras, it is most abundant in the southern section of the Chesapeake Bight. It occurs on soft bottoms, including sand and mud, at depths from 33-530 m, and is most common between 74 and 274 m. Juveniles tend to be found between 100 - 140 m. Major prey items include polychaetes, copepods, cumaceans, amphipods, Crangon, crabs, squid, octopods, and small fishes. A single fertilized egg is encapsulated in a leathery case. Egg cases are found in mature females most frequently in the summer (Packer et al. in press (d)).

Information on rosette skate is very limited. Because of the limited information available, the apparent dependence of the juveniles of this species on benthic organisms in its diet, and the reproductive habits of the adults, EFH vulnerability to mobile bottom gear was characterized as moderate.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 444 - Rosette Skate Pending EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	Offshore banks of GOME	31-874 mostly 110-457		Bottom habitats with a substrate of soft mud (silt and clay), sand, broken shells, gravel and pebbles	M	M	0	L	L
Adults	Offshore banks of GOME	31-874 mostly 110-457		Bottom habitats with a substrate of soft mud (silt and clay), sand, broken shells, gravel and pebbles	H	H	0	L	L

Rationale: Smooth skate (Malacoraja senta) center of abundance is the Gulf of Maine. It occurs along the Atlantic coast from the Gulf of St. Lawrence south to South Carolina, at depths between 31-874 m. It is most abundant between 110-457 m. Analysis of NEFSC trawl survey data found juvenile skate most abundant between depths of 100-300 m during the time period from 1963-69. Smooth skate are found mostly over soft mud and clay of the Gulf of Maine=s deepwater basins, but also over the Gulf=s off shore banks with substrates of sand, shell, and/or gravel (Packer et al. in press (e)).

The diet of smooth skate is generally limited to epifaunal crustaceans, with decapod shrimp and euphausids as the most common prey, followed by amphipods and mysids. The diet shifts from amphipods and mysids to decapods as smooth skate grow (Packer et al. in press (e)). The diet of smooth skate is more restricted than other skate species (McEachran 2002).

The vulnerability of juvenile smooth skate EFH to otter trawls and scallop dredges was characterized as moderate because of the dietary habits of this species. The vulnerability of adult EFH was rated as high for otter trawls and scallop dredges because of the benthic diet as well as the reproductive habits of the species. Vulnerability to clam dredges was considered to be none for juveniles and adults since this gear is not used in the Gulf of Maine.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descr iptions and may not completely agree with information provided in the rationale.**

Table 445 - Smooth Skate Pending EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	GOME and GB	18-2000 mostly 111-366		Bottom habitats with a substrate of sand gravel, broken shell, pebbles, and soft mud	M	M	0	L	L
Adults	GOME and GB	18-2000 mostly 111-366		Bottom habitats with a substrate of sand gravel, broken shell, pebbles, and soft mud	M	M	0	L	L

Rationale: Thorny skate (Amblyraja radiata) range from Greenland south to South Carolina. In the Northeast region, it is most commonly seen in the Gulf of Maine and on the Northeast Peak and northern Great South Channel of Georges Bank. It is one of the most common skates in the Gulf of Maine, and occurs over a wide variety of bottom substrates, from sand, gravel, and broken shell to mud. It is found at depths ranging from 18 - 1200 m, and is reported to be most common between 50-350 m. A single fertilized egg is encapsulated in an egg case. Females with fully formed egg cases have been captured year round, though the percentage of mature females with egg cases is higher in the summer (Packer et al. in press (f)).

The primary prey of thorny skates are polychaetes and decapods, followed by amphipods and euphausiids. Fish and mysids are also consumed in lesser quantities. According to a survey from Nova Scotia to Cape Hatteras, thorny skate prey varies with skate size. Skates less than 40 cm total length feed mostly on amphipods, skates greater than 40 cm fed on polychaetes and decapods, and fishes were a major dietary component for skates larger than 70 cm. In general, with increasing size, mysids decreased in the diet while fishes increased (Packer et al. in press (f)).

Since juvenile thorny skate appear to be more reliant on benthic invertebrates, vulnerability of EFH to otter trawls and scallop dredges for this life stage was characterized as moderate. For adults, EFH vulnerability to otter trawls and scallop dredges was characterized as moderate because of their reproductive habits. EFH vulnerability to clam dredges was rated as none for juveniles and adults since there is no overlap between thorny skate EFH and areas in which clam dredges are used.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 446 - Thorny Skate Pending EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

Life Stage	Geographic Area of EFH	Depth (m)	Seasonal Occurrence	EFH Description	EFH Vulnerability*				
					OT	SD	CD	PT	NL
Juveniles	Cape Cod Bay, GB, SNE shelf through MAB to North Carolina; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0-371 mostly <111		Bottom habitats with substrate of sand and gravel or mud	M	M	M	L	L
Adults	Cape Cod Bay, GB, SNE shelf through MAB to North Carolina; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0-371 mostly <111		Bottom habitats with substrate of sand and gravel or mud	M	M	M	L	L

Rationale: Winter skate (Leucoraja ocellata) are found from Newfoundland south to Cape Hatteras. They are most abundant on Georges Bank and in coastal waters south to the mouth of the Hudson River. They are found over substrates of sand, gravel, and mud, in depths from shore out to 371 m, and are most common in less than 111 m of water. A single fertilized egg is encapsulated in a leather case and deposited on the bottom during summer in the northern portion of the range. Deposition has been reported to extend through January off southern New England. Young are fully developed at hatching (Packer et al. 1999g).

Polychaetes and amphipods are the most important prey items, followed by decapods, isopods, bivalves, and fish. In general, crustaceans make up over 50% of the diet for skate smaller than 61 cm, and fish and bivalves are a major component of the diet for skates larger than 79 cm. Crustaceans declined in importance with increasing skate size while polychaetes increased, until skates reached 81 cm.

Since juvenile winter skate appear to be more reliant on benthic invertebrates, vulnerability of EFH to mobile gear for this life stage was characterized as moderate. For adults, EFH vulnerability to mobile gear was characterized as moderate because of their reproductive habits.

Definitions: GOME - Gulf of Maine; GB - Georges Bank; NE - New England; HAPC - Habitat Area of Particular Concern; YOY - Young-of-Year: OT - Otter Trawls; SD - New Bedford Scallop Dredge; CD - Hydraulic Clam Dredge; PT - Pots and Traps; NL - Gill Nets and Longlines. NA - not applicable; 0 - No vulnerability; L - Low vulnerability; M - moderate vulnerability; H - high vulnerability; EFH - essential fish habitat; * derived from matrix analysis – see appendix. **Note that the information presented in columns 2-5 is derived from the EFH descriptions and may not completely agree with information provided in the rationale.**

Table 447 - Winter Skate Pending EFH - Vulnerability to Effects of Bottom-Tending Fishing Gear

9.3.1.6 Vulnerability Analysis – Methodology and Matrix

A simple matrix (

Black Sea Bass (A)	2	1	0	2	5	2	2	2	10	10	10	High	High	High
Black Sea Bass (J)	2	1	0	2	5	2	2	2	10	10	10	High	High	High
Clearnose Skate (A)	1	1	1	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Clearnose Skate (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Haddock (A)	1	2	0	2	5	2	2	1	10	10	5	High	High	Low
Haddock (J)	2	2	0	2	6	2	2	1	12	12	6	High	High	Low
Little Skate (A)	1	1	1	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Little Skate (E)	0	0	1	1	2	2	2	2	4	4	4	Low	Low	Low
Little Skate (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Monkfish (A)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Monkfish (J)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low

Table 449) was developed for each benthic life stage for each species to determine the vulnerability of its EFH to effects from bottom tending mobile gear. Six criteria were qualitatively evaluated for each life stage based upon existing information. Each evaluation consisted of a score based upon a predefined threshold. The first three criteria were related to habitat function and included shelter, food and reproduction. Scores for these criteria were determined as follows:

Shelter: (Scored from 0-2) If the lifestage has no dependence upon bottom habitat to provide shelter then a 0 was selected. Almost every lifestage evaluated has some dependence upon the bottom for shelter so 0 was seldom used with the exception of a few egg lifestages. If the lifestage has some dependence upon unstructured or non-complex habitat for shelter it was scored a 1. For example, flatfishes that rely primarily on cryptic coloration for predator avoidance or small scale sand waves for refuge were scored a 1. If the lifestage has a strong reliance on complex habitats for shelter it was scored a 2. For example, species such as juvenile cod and haddock that are heavily reliant on structure or complex habitat for predator avoidance were scored a 2.

Food: (Scored from 0-2) If the lifestage has no dependence on benthic prey it was scored a 0. For example, eggs were always scored a 0 as were lifestages that fed exclusively in the plankton. If the lifestage utilizes benthic prey for part of its diet but not exclusively a benthic feeder it was scored a 1. For example, species feeding opportunistically on crabs as well as squid or fish were scored a 1. If the lifestage feeds exclusively on benthic organisms and cannot change its mode of feeding it was scored a 2.

Reproduction: (Scored from 0-1) If the species has no dependence upon bottom habitats for spawning or its lifestage was not a reproductive stage it was scored a 0. For example, species that spawn in the water column were scored a 0 as well as juveniles of all species. If the species has some dependence upon bottom habitats for spawning it was scored a 1. For example, species that spawn on or over the bottom were scored a 1. This criteria was the most difficult to assess since there is limited knowledge on spawning behaviors for many species.

Habitat Sensitivity: (Scored from 0-2) This criterion no longer evaluates the function of the habitat for the species but looks at its overall sensitivity to disturbances in a relative fashion. The habitat needed by the species was based primarily upon its EFH designation. If a habitat was not considered sensitive to disturbance it was scored a 0. However, a score of 0 was not used for any benthic habitat type. If the habitat was considered to have a low sensitivity it was scored a 1. For example, habitats that are typically characterized as high energy environments without structural complexity or have rapid recovery rates they were scored a 1 (e.g. high energy sand environments). If the habitat type was considered highly sensitive it was scored a 2. For example, habitats that are characterized as structurally complex (such as habitats supporting epibenthic communities, boulder pile fields, etc.) or have very slow recovery rates (such as low energy deepwater environments) were scored a 2. These scores were based upon the existing conceptual models that show a direct relationship between structural complexity of the habitat and recovery time with increasing vulnerability.

Habitat Rank: The habitat rank was determined quantitatively as the sum of the previous scores (shelter + food + reproduction + habitat sensitivity). Another way to characterize the habitat rank is the relative vulnerability of the habitat to non-natural physical disturbance. The rank could range from 0-7, with 7 being the most vulnerable.

Gear Distribution: (Scored from 0-2) This criterion factors in the use of a particular gear type (otter trawl, scallop dredge, hydraulic clam dredge) in EFH for a particular lifestage. If the gear is not used in the described EFH it was scored a 0. If the gear operates in only a small portion of the described EFH it was scored a 1. If the gear operates in more than a small amount of the described EFH it was scored a 2. Distribution was determined as the qualitative overlap of EFH on the Vessel Trip Report location data which has been described in previous sections of this report.

Gear Rank: The gear rank provides the vulnerability of EFH to a particular gear type and was calculated as the product of the Habitat Rank x Gear Distribution. Based upon natural breaks in the rankings frequency distribution the following interpretations of the ranking have be made: **0 = no vulnerability** to the gear. This could only be attained if the gear was not used in the habitat (gear distribution = 0). **1 - 6 = low vulnerability** to the gear. This generally occurred where the gear has minimal overlap with EFH (gear distribution = 1) and Habitat Rank was less than 7. Additionally, low vulnerability could be in habitats with high gear overlap (gear distribution = 2) but where Habitat Rank was low (3 or less). **7 - 9 = moderate vulnerability** to the gear. This typically occurred where gear overlap with EFH was high (gear distribution = 2) and habitat rank was 4 or, overlap with EFH was low (gear distribution = 1) and Habitat Rank was 7. **10 - 14 = high vulnerability** to the gear. This occurred only if the gear overlap with EFH was high (gear distribution = 2) and the habitat rank was 5 or more.

GEAR RANK (Vulnerability of EFH to particular gear) = (Habitat Rank) x (Gear Distribution)

CRITERIA	RANK	KEY
Shelter	0-2	0 = no dependence 1 = lower dependence, not reliant on complex structure 2 = strong dependence, reliant on complex structure
Food	0-2	0 = no dependence on benthic prey 1 = includes benthic prey 2 = relies exclusively on benthic prey
Reproduction	0-1	0 = no dependence (e.g. spawns in water column or life stage not reproductive) 1 = dependence (e.g. spawns on or over bottom)
Habitat Sensitivity	0-2	0 = not sensitive 1 = low sensitivity (i.e. no habitat structure/complexity issues, rapid recovery rates, e.g. high energy sand habitats 2 = highly sensitive (e.g. habitat structural/complexity issues, slow recovery rates, i.e. deep water/low energy habitats)
Habitat Rank	**= Shelter + Food +Reproduction + Habitat Sensitivity**	
Gear Distribution	0-2	0 = gear not utilized in this habitat 1 = gear operates in a small portion of this habitat 2 = gear operates in much of this habitat
Gear Rank	**= Habitat Rank X Gear Distribution**	

Table 448 - Summary of the criteria used to identify the EFH vulnerability determinations.

Summary: GEAR RANK is the vulnerability of the EFH to the gear type. In terms of the EFH Vulnerability Section, Gear Rank is the following: 0 = none, 1-6 = Low vulnerability, 7-9 = Moderate vulnerability, 10-14 = High vulnerability.

Species	Shelter	Food	Repro	Habitat Sensitivity	Habitat Rank	OT Dist.	SD Dist.	CD Dist.	OT Rank	SD Rank	CD Rank	OT Vuln.	SD Vuln.	CD Vuln.
American Plaice (A)	1	2	1	1	5	2	2	0	10	10	0	High	High	None
American Plaice (J)	1	2	0	1	4	2	2	0	8	8	0	Mod	Mod	None
Atlantic Cod (A)	1	1	0	2	4	2	2	1	8	8	4	Mod	Mod	Low
Atlantic Cod (J)	2	1	0	2	5	2	2	0	10	10	0	High	High	None
Atlantic Halibut (A)	1	1	1	1	4	2	2	0	8	8	0	Mod	Mod	None
Atlantic Halibut (J)	1	2	0	1	4	2	2	0	8	8	0	Mod	Mod	None
Atlantic Herring (E)	0	0	1	1	2	2	2	0	4	4	0	Low	Low	None
Atlantic Herring (SA)	0	0	1	1	2	2	2	0	4	4	0	Low	Low	None
Atlantic Scallops (A)	1	0	1	1	3	2	2	2	6	6	6	Low	Low	Low
Atlantic Scallops (J)	2	0	0	1	3	2	2	2	6	6	6	Low	Low	Low
Barndoor Skate (A)	1	1	1	1	4	2	2	1	8	8	4	Mod	Mod	Low
Barndoor Skate (J)	1	2	0	1	4	2	2	1	8	8	4	Mod	Mod	Low
Black Sea Bass (A)	2	1	0	2	5	2	2	2	10	10	10	High	High	High
Black Sea Bass (J)	2	1	0	2	5	2	2	2	10	10	10	High	High	High
Clearnose Skate (A)	1	1	1	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Clearnose Skate (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Haddock (A)	1	2	0	2	5	2	2	1	10	10	5	High	High	Low
Haddock (J)	2	2	0	2	6	2	2	1	12	12	6	High	High	Low
Little Skate (A)	1	1	1	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Little Skate (E)	0	0	1	1	2	2	2	2	4	4	4	Low	Low	Low
Little Skate (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Monkfish (A)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Monkfish (J)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low

Table 449 -EFH Vulnerability Matrix Analysis

Shaded rows signify species in the Northeast Multispecies FMP management unit

Species	Shelter	Food	Repro	Habitat Sensitivity	Habitat Rank	OT Dist.	SD Dist.	CD Dist.	OT Rank	SD Rank	CD Rank	OT Vuln.	SD Vuln.	CD Vuln.
Ocean Pout (A)	2	2	1	2	7	2	2	2	14	14	14	High	High	High
Ocean Pout (E)	2	0	1	2	5	2	2	2	10	10	10	High	High	High
Ocean Pout (L)	2	0	1	2	5	2	2	2	10	10	10	High	High	High
Ocean Pout (J)	2	2	0	2	6	2	2	2	12	12	12	High	High	High
Ocean Quahog (A)	1	0	1	1	3	2	2	2	6	6	6	Low	Low	Low
Ocean Quahog (J)	1	0	0	1	2	2	2	2	4	4	4	Low	Low	Low
Offshore Hake (A)	1	1	0	1	3	2	1	0	6	3	0	Low	Low	None
Offshore Hake (J)	1	1	0	1	3	2	1	0	6	3	0	Low	Low	None
Pollock (A)	1	1	1	1	4	2	2	1	8	8	4	Mod	Mod	Low
Pollock (J)	1	1	0	1	3	2	2	1	6	6	3	Low	Low	Low
Red Crab (A)	1	1	1	2	5	1	0	0	5	0	0	Low	None	None
Red Crab (J)	1	1	0	2	4	1	0	0	4	0	0	Low	None	None
Red Hake (A)	1	2	0	1	4	2	2	1	8	8	4	Mod	Mod	Low
Red Hake (J)	2	2	0	2	6	2	2	2	12	12	12	High	High	High
Redfish (A)	1	1	0	2	4	2	2	0	8	8	0	Mod	Mod	None
Redfish (J)	2	1	0	2	5	2	2	0	10	10	0	High	High	None
Rosette Skate (A)	1	1	1	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Rosette Skate (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Scup (A)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Scup (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Silver Hake (A)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Silver Hake (J)	1	1	0	2	4	2	2	2	8	8	8	Mod	Mod	Mod
Smooth Skate (A)	1	2	1	1	5	2	2	0	10	10	0	High	High	None
Smooth Skate (J)	1	2	0	1	4	2	2	0	8	8	0	Mod	Mod	None
Spiny Dogfish (A)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Spiny Dogfish (J)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low

Table 449 -EFH Vulnerability Matrix Analysis (cont.)

Species	Shelter	Food	Repro	Habitat Sensitivity	Habitat Rank	OT Dist.	SD Dist.	CD Dist.	OT Rank	SD Rank	CD Rank	OT Vuln.	SD Vuln.	CD Vuln.
Summer Flound. (A)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Summer Flound. (J)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Surfclam (A)	1	0	1	1	3	2	2	2	6	6	6	Low	Low	Low
Surfclam (J)	1	0	0	1	2	2	2	2	4	4	4	Low	Low	Low
Thorny Skate (A)	1	1	1	1	4	2	2	0	8	8	0	Mod	Mod	None
Thorny Skate (J)	1	2	0	1	4	2	2	0	8	8	0	Mod	Mod	None
Tilefish (A)	2	2	0	1	5	2	1	0	10	5	0	High	Low	None
Tilefish (J)	2	2	0	1	5	2	1	0	10	5	0	High	Low	None
White Hake (A)	1	1	0	1	3	2	2	0	6	6	0	Low	Low	None
White Hake (J)	1	2	0	1	4	2	2	0	8	8	0	Mod	Mod	None
Windowpane Flndr (A)	1	0	0	1	2	2	2	2	4	4	4	Low	Low	Low
Windowpane Flndr (J)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Winter Flounder (A)	1	1	1	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Winter Flounder (E)	0	0	1	1	2	2	2	2	4	4	4	Low	Low	Low
Winter Flounder (J)	1	1	0	1	3	2	2	2	6	6	6	Low	Low	Low
Winter Skate (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Winter Skate(A)	1	1	1	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Witch Flounder (A)	1	2	0	1	4	2	1	1	8	4	4	Mod	Low	Low
Witch Flounder (J)	1	2	0	1	4	2	1	0	8	4	0	Mod	Low	None
Yellowtail Flound (A)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod
Yellowtail Flound (J)	1	2	0	1	4	2	2	2	8	8	8	Mod	Mod	Mod

Table 449 -EFH Vulnerability Matrix Analysis (cont.)

9.3.1.7 Statement of Council Concurrence

The Council concurs with the conclusions reached by the Gear Effects Workshop and reviewed by in this document concerning the description of effects on benthic habitat and determinations of adverse effects of fishing on EFH by gears used in the multispecies fishery in the Northeastern U.S.

9.3.1.8 Summary of Adverse Impacts

The EFH Final Rule (50 CFR Part 600) provides guidance to the Regional Fishery Management Councils for identifying fishing activities that adversely impact essential fish habitat (EFH). In addition to the EFH Final Rule, guidance provided by the Habitat Conservation Division (HCD) headquarters office in the form of a memo dated October 2002 was followed in the preparation of this section of Amendment 13. This evaluation should primarily include the impacts of activities associated with the fishery that is the subject of the management action, as well as other federally-managed and state-managed fishing activities. Based on the guidance provided by the EFH Final Rule and the HCD office, this determination focuses on the effects of fishing activities in the New England multi-species fishery on groundfish EFH. It also includes information on the effects of other federally-managed fishing activities on groundfish EFH, and identifies gears used in state-managed fisheries that could affect groundfish EFH. Most of the information needed to complete this determination is provided in more detail in previous sub-sections of 9.3.1.2 and 9.3.1.3.

The EFH Final Rule also stipulates that "each FMP must minimize to the extent practicable the adverse effects of fishing on EFH that is designated under other federal FMPs". Federally-managed species that could be affected by the New England groundfish fishery are listed in Table 449. These species and life stages were ranked according to the vulnerability of their EFH to the effects of mobile, bottom-tending gear (see Section 9.3.1.3). EFH for those ranked as moderately or highly vulnerable were included in this adverse impacts evaluation.

For this determination, fishing activities are interpreted to mean fishing gears, since there is not enough information available to support a more detailed determination based on different fishing practices used with each gear type. Adverse impacts associated with each gear type are assessed for specific habitat types that make up groundfish EFH. Only benthic habitats are considered, since the gears used to catch groundfish are bottom-tending gears. Habitat type is based on type of substrate, and, to some extent, depth and degree of exposure to natural disturbance. These simplifications were made in order to allow maximum use of the information available and to provide an evaluation that encompasses as broad a range of the relevant fisheries and affected habitats as possible.

EFH for those ranked as moderately or highly vulnerable were included in this adverse impacts evaluation. For the purposes of this action, EFH vulnerability that is ranked as low is considered to have a potential adverse effect to EFH that is minimal and temporary in nature. Therefore, the Council will eliminate from further consideration any EFH that has a low vulnerability to scallop dredges, otter trawls and clam dredges. Refer to Table 449 for a detailed look at the vulnerability rankings based on shelter, food, reproduction, habitat sensitivity, habitat rank, gear distribution and gear rank. Background on how vulnerability was determined in this exercise is useful for understanding how EFH could be adversely affected as a result of fishing with different gear types. Vulnerability was divided into four broad categories, including: none (0); low (L); moderate (M); and high (H), based upon a matrix analysis of habitat function, habitat sensitivity and gear use. Several criteria were qualitatively evaluated for each life stage based upon existing information. Each evaluation consisted of a score based upon a predefined threshold. The criteria used and the key describing what each ranking stands for is described in Table 448. Depth range and substrates that are included in the EFH designations for those species that have been determined to be adversely impacted indicate that, as a group, they occupy a wide range of depths and bottom types (Table 450).

Species	Lifestage	Vuln. to Otter Trawling	Vuln. to Scallop Dredging	Vuln. To Clam Dredges	Depth (m) (EFH Designation)	Substrate (EFH Designation)
American Plaice	A	High	High	None	45-150	sand or gravel
American Plaice	J	Mod	Mod	None	45-175	sand or gravel
Atlantic Cod	A	Mod	Mod	Mod	25-75	cobble or gravel
Atlantic Cod	J	High	High	None	10-150	rocks, pebble, gravel
Atlantic Halibut	A	Mod	Mod	None	20-60	sand, gravel, clay
Atlantic Halibut	J	Mod	Mod	None	100-700	sand, gravel, clay
Barndoor Skate	A	Mod	Mod	Low	0-750, mostly <150	mud, gravel, and sand
Barndoor Skate	J	Mod	Mod	Low	0-750, mostly <150	mud, gravel, and sand
Black Sea Bass	A	High	High	High	20-50	structures, sand and shell
Black Sea Bass	J	High	High	High	1-38	rough bottom, shell and eelgrass beds, structures and offshore clam beds in winter
Clearnose Skate	A	Mod	Mod	Mod	0-500, mostly <111	soft bottom along shelf and rocky or gravelly bottom
Clearnose Skate	J	Mod	Mod	Mod	0-500, mostly <111	soft bottom along shelf and rocky or gravelly bottom
Haddock	A	High	High	Low	35-100	pebble gravel
Haddock	J	High	High	Low	40-150	broken ground, pebbles, smooth hard sand, smooth areas between rocky patches
Little Skate	A	Mod	Mod	Mod	0-137, mostly 73-91	sand or gravel or mud
Little Skate	J	Mod	Mod	Mod	0-137, mostly 73-91	sand or gravel or mud

Table 450 - Summary species and life stage's EFH adversely impacted by otter trawling, scallop dredging and hydraulic clam dredging.

Species	Lifestage	Vuln. to Otter Trawling	Vuln. to Scallop Dredging	Vuln. To Clam Dredges	Depth (m) (EFH Designation)	Substrate (EFH Designation)
Ocean Pout	A	High	High	High	<110	soft sediments
Ocean Pout	J	High	High	High	<80	smooth bottom near rocks or algae
Ocean Pout	L	High	High	High	<50	close to hard bottom nesting areas
Ocean Pout	E	High	High	High	<50	hard bottom, sheltered holes
Pollock	A	Mod	Mod	Low	15-365	hard bottom, artificial reefs
Red Hake	A	Mod	Mod	Low	10-130	sand and mud
Red Hake	J	High	High	High	<100	shell and live scallops
Redfish	A	Mod	Mod	None	50-350	silt, mud, or hard bottom
Redfish	J	High	High	None	25-400	silt, mud, or hard bottom
Rosette Skate	A	Mod	Mod	Mod	33-530, mostly 74-274	soft substrates including sand/mud and mud
Rosette Skate	J	Mod	Mod	Mod	33-530, mostly 74-274	soft substrates including sand/mud and mud
Scup	J	Mod	Mod	Mod	0-38	inshore sand, mud, mussel and eelgrass beds
Silver Hake	J	Mod	Mod	Mod	20-270	all substrate types
Smooth Skate	A	High	High	None	31-874, mostly 110-457	soft mud, sand, broken shells, gravel and pebbles
Smooth Skate	J	Mod	Mod	None	31-874, mostly 110-457	soft mud, sand, broken shells, gravel and pebbles
Thorny Skate	A	Mod	Mod	None	18-2000, mostly 111-366	sand gravel, broken shell, pebble, and soft mud
Thorny Skate	J	Mod	Mod	None	18-2000, mostly 111-366	sand gravel, broken shell, pebble, and soft mud

Table 450 - Summary species and life stage's EFH adversely impacted by otter trawling, scallop dredging and hydraulic clam dredging. (cont.)

Species	Lifestage	Vuln. to Otter Trawling	Vuln. to Scallop Dredging	Vuln. To Clam Dredges	Depth (m) (EFH Designation)	Substrate (EFH Designation)
Tilefish	A	High	Low	None	76-365	rough, sheltered bottom
Tilefish	J	High	Low	None	76-365	rough, sheltered bottom
White Hake	J	Mod	Mod	None	5-225	pelagic during pelagic stage and mud or fine sand during demersal stage
Winter Flounder	A	Mod	Mod	Mod	1-100	estuaries with mud, gravel, or sand
Winter Skate	A	Mod	Mod	Mod	0-371, mostly <111	sand, gravel, or mud
Winter Skate	J	Mod	Mod	Mod	0-371, mostly <111	sand, gravel, or mud
Witch Flounder	A	Mod	Low	Low	25-300	fine-grained sediment
Witch Flounder	J	Mod	Low	None	50-450	fine-grained sediment
Yellowtail Flounder	A	Mod	Mod	Mod	20-50	sand and mud
Yellowtail Flounder	J	Mod	Mod	Mod	20-50	sand and mud

Table 450 - Summary species and life stage's EFH adversely impacted by otter trawling, scallop dredging and hydraulic clam dredging. (cont.)

Species	Lifestage	Vuln. to Otter Trawling	Vuln. to Scallop Dredging	Vuln. To Clam Dredges	Depth (m) (EFH Designation)	Substrate (EFH Designation)
Rosette Skate	A	Mod	Mod	Mod	33-530, mostly 74-274	soft substrates including sand/mud and mud
Rosette Skate	J	Mod	Mod	Mod	33-530, mostly 74-274	soft substrates including sand/mud and mud
Scup	J	Mod	Mod	Mod	0-38	inshore sand, mud, mussel and eelgrass beds
Silver Hake	J	Mod	Mod	Mod	20-270	all substrate types
Smooth Skate	A	High	High	None	31-874, mostly 110-457	soft mud, sand, broken shells, gravel and pebbles
Smooth Skate	J	Mod	Mod	None	31-874, mostly 110-457	soft mud, sand, broken shells, gravel and pebbles
Thorny Skate	A	Mod	Mod	None	18-2000, mostly 111-366	sand gravel, broken shell, pebble, and soft mud
Thorny Skate	J	Mod	Mod	None	18-2000, mostly 111-366	sand gravel, broken shell, pebble, and soft mud
Tilefish	A	High	Low	None	76-365	rough, sheltered bottom
Tilefish	J	High	Low	None	76-365	rough, sheltered bottom
White Hake	J	Mod	Mod	None	5-225	pelagic during pelagic stage and mud or fine sand during demersal stage
Winter Flounder	A	Mod	Mod	Mod	1-100	estuaries with mud, gravel, or sand

Table 3 - Summary species and life stage's EFH adversely impacted by otter trawling, scallop dredging and hydraulic clam dredging. (*cont.)*

Species	Lifestage	Vuln. to Otter Trawling	Vuln. to Scallop Dredging	Vuln. To Clam Dredges	Depth (m) (EFH Designation)	Substrate (EFH Designation)
Winter Skate	A	Mod	Mod	Mod	0-371, mostly <111	sand, gravel, or mud
Winter Skate	J	Mod	Mod	Mod	0-371, mostly <111	sand, gravel, or mud
Witch Flounder	A	Mod	Low	Low	25-300	fine-grained sediment
Witch Flounder	J	Mod	Low	None	50-450	fine-grained sediment
Yellowtail Flounder	A	Mod	Mod	Mod	20-50	sand and mud
Yellowtail Flounder	J	Mod	Mod	Mod	20-50	sand and mud

Table 3 - Summary species and life stage's EFH adversely impacted by otter trawling, scallop dredging and hydraulic clam dredging. (*cont.*)

9.3.1.8.1 EFH Designations

Fifteen species are included in the NEFMC Multispecies Fishery Management Plan. Depth ranges and substrates that are included in the EFH designations for the benthic life stages of these species (Table 451) indicate that, as a group, they occupy a wide range of depths and bottom types.

Species	Life Stage	Depth	Substrate
American Plaice	A	45-150	Fine-grained sediments or substrate of sand or gravel
American Plaice	J	45-175	Fine-grained sediments or substrate of sand or gravel
Atlantic Cod	A	10-150	Rocks, pebbles, or gravel
Atlantic Cod	J	25-75	Cobble or gravel
Atlantic Halibut	A	20-60	Sand, gravel, or clay
Atlantic Halibut	J	100-700	Sand, gravel, or clay
Haddock	A	35-100	Pebble gravel
Haddock	J	40-150	*Broken ground, pebbles, smooth hard sand, smooth*
Ocean Pout	A	<110	Dig depressions in soft sediments
Ocean Pout	J	<80	*Smooth bottom near rocks or algae*
Ocean Pout	L	<50	*Close to nesting areas*
Ocean Pout	E	<50	*Sheltered nests in holes or crevices on hard bottom*
Offshore Hake	A	150-380	*Bottom habitats*
Offshore Hake	J	170-350	*Bottom habitats*
Pollock	A	15-365	Hard bottom including artificial reefs
Pollock	J	0-250	Aquatic vegetation or a substrate of sand, mud, or
Red Hake	A	10-130	Depressions with a substrate of sand and mud
Red Hake	J	<100	Shell fragments and live scallops
Redfish	A	50-350	Silt, mud, or hard bottom
Redfish	J	25-400	Silt, mud, or hard bottom
White Hake	A	5-325	Mud or fine-grained sand
White Hake	J	5-225	Seagrass beds or substrate of mud or fine-grained
Whiting	A	30-325	All substrate types
Whiting	J	20-270	All substrate types
Windowpane	A	1-75	Mud or fine-grained sand
Windowpane	J	1-100	Mud or fine-grained sand
Winter Flounder	A	1-100	Mud, sand, or gravel
Winter Flounder	J	1-50	Mud or fine-grained sand
Witch Flounder	A	25-300	Fine-grained substrate
Witch Flounder	J	50-450	Fine-grained substrate
Yellowtail Flounder	A	20-50	Sand or sand and mud
Yellowtail Flounder	J	20-50	Sand or sand and mud

Table 451 - Depths and Substrates Associated With Essential Fish Habitats for Benthic Life Stages of 15 Species Included in the New England Multi-Species Fishery Management Plan

A similar description of the depth and substrate features of EFH for the remaining 18 federally-managed species with benthic life stages is not included because EFH for the 15 species that are managed under the Multi-Species FMP already covers a broad range of habitat types. The areal extent of EFH for the juvenile and adult stages of all 33 species includes virtually the entire Northeast shelf.

9.3.1.8.2 Gear Descriptions

Commercial fishing gear types that contact the bottom and are defined for data-reporting purposes are listed in Table 393. Some of them are federally-regulated and others that are only used in state waters are not.

Federally-regulated gears that contact the bottom can be divided into two types, mobile and stationary (or fixed) gears. Mobile, bottom-tending gears fall into two major groups, trawls and dredges. Types of trawls used in the Northeast region include otter trawls for fish, scallops, and shrimp, and Scottish and Danish seines. Federally-managed dredges include scallop and clam dredges. Bottom-tending fixed gears include sink and stake gill nets, long lines, pots and traps used to catch lobsters, crabs, and fish, and floating traps. Descriptions of these gears, and other gears used in the Northeast Region, are provided in 9.3.1.2.2 of this document. The descriptions for trawls and dredges include some information on individual components that contact the bottom and some details about fishing practices (types of bottom fished, towing speeds, etc.). Bottom otter trawls are described as a single category, with some information on differences in gear design and configuration for trawls used to target particular resources (fish, scallops, or shrimp) or habitat types (smooth vs. rocky bottom). Of all the bottom-tending gears that have the potential to adversely affect benthic EFH in the NE region, bottom otter trawls are the most diverse group.

9.3.1.8.3 Distribution of Fishing Activity

The three primary gears used to harvest groundfish in New England are bottom otter trawls, bottom gill nets, and bottom longlines. Two other bottom-tending gears used in other federally-managed fisheries are hydraulic clam dredges and scallop dredges. Information on the spatial distribution of fishing activity for these five gear types during 1995-2001 is provided in 9.3.1.2.3. The geographic distributions of the ten minute squares (TMS) of latitude and longitude that accounted for most of the trips or days absent from port reported in the NMFS vessel trip database for these five gears are as follows:

Bottom gill net trips during 1995-2001 were made primarily in the Gulf of Maine (GOM). Gill net trips were most common in coastal waters in the southwestern portion of the GOM, with some trips reported offshore in the central portion of the Gulf (Figure 242). No gill net fishing was reported in coastal waters of central and eastern Maine. Outside the GOM, gill net trips were reported along the western side of the Great South Channel, in Rhode Island coastal waters, along the south shore of Long Island, and off New Jersey, the Delaware-Maryland-Virginia (DelMarVa) Peninsula, and North Carolina. A few trips were also made in three ten minute squares along the 100 fathom contour at the shelf break in southern New England and (apparently) in a single TMS in even deeper water southeast of Hudson Canyon. Gill net trips made in federal waters were about five times more numerous during 1995-2001 than bottom longline trips.

Bottom longlining during 1995-2001 was conducted primarily in coastal waters of the southwestern GOM and extended southeast of Cape Cod along the western edge of the Great South Channel (Figure 243.) A few trips were also reported on the northern edge of Georges Bank (GB), in the outer portion of the GOM, in southern New England (SNE) coastal waters, and in several TMS along the outer continental shelf – particularly south of Nantucket Island and in the vicinity of Hudson Canyon.

Bottom trawling in federal waters in the Northeast region during 1995-2001 accounted for 150% more days absent from port as scallop dredging and 23 times more days absent than days spent fishing with clam dredges. Significant areas were closed to bottom trawlers on GB and in SNE (Figure 241). Bottom trawling, more than any other fishing activity, was conducted to a greater extent in deeper water in the GOM, north of GB, and along the shelf break in SNE and the Mid-Atlantic (MA) region. A continuous area of high trawling activity occurred from the central GOM west to the coast, then through the southwestern GOM, down the west side of the Great South Channel and east across the top of Closed Area I on GB. Trawling was also reported west and south of Closed Area II on eastern GB, on the southern portion of GB, throughout most of SNE in inner, mid, and outer shelf waters, along the shelf break in the MA, and in North Carolina coastal waters. There was a large open access area with no, or minimal, trawling in the middle and inner portions of the MA shelf from the New York Bight south to the North Carolina border. Trawling activity was fairly evenly distributed among the four sub-regions of the Northeast shelf (see map of sub-regions, Figure 241).

Scallop dredging in federal waters in the Northeast region during 1995-2001 accounted for less than half as many days absent as bottom trawling, but nearly ten times more time at sea than was spent dredging with hydraulic clam dredges. Scallop dredging during 1995-2001 was reported in TMS along the eastern Maine coast, in the extreme southwestern "corner" of the GOM north of Cape Cod, along the western side of the Great South Channel, along the northern edge of GB and on its southeastern flank, and in a very large continuous area reaching from the eastern end of Long Island south across the shelf that included outer shelf waters as far south as the North Carolina border (Figure 245). Large expanses of bottom area in the outer GOM, in the central part of GB, in SNE, and in inner shelf waters of the MA did not support any notable amount of scallop dredging. Unlike bottom trawling, scallop dredging was almost completely confined to depths shallower than 50 fathoms. Analysis of VTR data by sub-region showed that about half of the reported scallop dredging days at sea were in the MA sub-region, about 30% in the GB sub-region (the same proportion as for trawls), 10% in SNE, and 5% or less in the GOM.

Hydraulic clam dredging activity was much less intensive during 1995-2001 than for either of the other two major types of mobile gear. Hydraulic clam dredging took place in SNE and the MA, generally in shallower shelf waters than scallop dredging and trawling (Figure 246). A cluster of TMS off the New Jersey coast was heavily fished, as were other TMS further out toward the edge of the shelf, south of Long Island, and in SNE waters. Clam dredges do not operate on GB because ocean quahogs on the bank contain red tide-causing micro-organisms and cannot be harvested. Hydraulic clam dredging is restricted to sandy and muddy sand substrates because the gear can be damaged in hard bottom areas. For this reason, hydraulic dredges are not used in the GOM.

9.3.1.8.4 Potential Adverse Impacts of Fishing Activities

9.3.1.8.4.1 Gears That Could Adversely Impact Groundfish EFH

Of the five gear types that are either used to harvest the 15 species of groundfish that are managed under the NEFMC Multi-Species FMP, or which are capable of catching groundfish (i.e., as by-catch), or which are used in other federally-managed fisheries, there are three that could adversely affect benthic EFH for the 15 groundfish species listed in Table 451. These are bottom otter trawls, scallop dredges, and hydraulic clam dredges. This conclusion is based on two recent reports. The first of these (NREFHSC 2002) is the report of a workshop held in October 2001 that examined the habitat effects of gears used in the Northeast region on three substrate types (gravel, sand, and mud). A panel of experts concluded that otter trawls and scallop dredges were the two highest priority gears in terms of impacts, with minimal impacts for clam dredges, nets and lines, and pots and traps. Clam dredges were ranked lower than otter trawls and scallop dredges because they are used primarily in sandy, high-energy environments that are exposed to extreme natural disturbances and because the fishery operates in a much smaller area than the scallop and groundfish fisheries.

The second report (Morgan and Chuenpagdee 2003) evaluated the effects of ten different commercial fishing gears on marine ecosystems in U.S. waters. It differentiated between habitat impacts and by-catch issues and listed the effects of each gear type in more detail than the first report. (It also relied on input from a larger group of experts and used more scientifically-based methods for collecting and analyzing the information). The report concluded that bottom trawls and dredges have very high habitat impacts, bottom gillnets and pots and traps have low to medium impacts, and bottom longlines have low impacts. Individual types of trawls and dredges were not evaluated. The impacts of bottom gill nets, traps, and longlines were limited to warm or shallow-water environments with rooted aquatic vegetation or "live bottom" environments (e.g., coral reefs).

9.3.1.8.4.2 Potential Adverse Impacts of Bottom Trawls and Dredges

Section 9.3.1.2.4 of this document describes the general effects of trawls and dredges on benthic marine habitats, as reported in three recent reports (ICES 2000, Johnson (2002), and NRC (2002). (The report by Morgan and Chuenpagdee was not available when this summary was written: it generally confirms the findings of the other three reports). All four of these reports are international or national in scope and include information on the effects of types of trawls and dredges not used in the Northeast region of the U.S. (e.g., beam trawls and toothed scallop dredges) and affected habitats not found in the NE region (e.g, coral reefs and maerl beds). The conclusions reached are, nevertheless, pertinent to an evaluation of potential adverse impacts of the types of trawls and dredges used in this region. To re-iterate, the four major types of habitat modification caused by bottom trawls that are identified in the ICES (2001) report are the following:

Loss or dispersal of physical features such as peak banks or boulder reefs (changes are always permanent and lead to an overall change in habitat diversity, which can in turn lead to the local loss of species and species assemblages dependant on such features);

Loss of structure-forming organisms such as bryozoans, tube-dwelling polychaetes, hydroids, seapens, sponges, mussel beds, and oyster beds (changes may be permanent and can lead to an overall change in habitat diversity which can in turn lead to the local loss of species and species assemblages dependant on such biogenic features);

Reduction in complexity caused by redistributing and mixing of surface sediments and the degradation of habitat and biogenic features, leading to a decease in the physical patchiness of the sea floor (changes are not likely to be permanent);

Alteration of the detailed physical features of the sea floor by reshaping seabed features such as sand ripples and damaging burrows and associated structures which provide important habitats for smaller animals and can be used by fish to reduce their energy requirements (changes are not likely to be permanent).

The NRC (2002) report also identified three major effects of trawling and dredging, the first two of which are also mentioned in the ICES (2001) report:

- Reduced habitat complexity;
- Discernible changes in benthic communities (caused by repeated trawling and dredging);
- Reduced productivity of benthic habitats.

The four effects of trawling identified in the ICES (2001) report are listed in order of decreasing permanence. Given the MSA definition of “adverse” as “more than minimal and not temporary,” the first effect is clearly adverse. The second effect may be permanent and the other two are not likely to be permanent. However, they are still considered as potential adverse impacts since they are effects that could persist in certain habitats that are exposed to more or less continual, or frequently repeated, trawling activity. Furthermore, given the similarity in the habitat effects of dredges and trawls noted in the NRC (2002) and Morgan and Chuenpagdee (2003) reports, all of these potential adverse effects are considered to apply equally well to both gear types.

Looking at the effects of bottom trawls, scallop dredges, and hydraulic clam dredges in the NE region, there is more specific information to evaluate. According to the October 2001 workshop report (NREFHSC 2002), otter trawls had greater overall impacts than scallop dredges, but affected physical and biological structure equally. Effects on biological structure scored higher than effects on physical structure for both gears. In addition, trawls were judged to have some effects on major physical features.

Additional information is provided in this report on the recovery times for each type of impact for all three gears in mud, sand, and gravel habitats ("gravel" includes other hard-bottom habitats). This information makes it possible to rank these three substrates in terms of their vulnerability to the effects of bottom trawling and dredging, bearing in mind that other factors such as frequency of disturbance from fishing and from natural events are also important. Otter trawls and scallop dredges were assigned higher impact scores in gravel, mud ranked second for trawls (and sand third), and sand ranked second for scallop dredges (this gear is not used in mud habitats). Clam dredges had low impacts compared to scallop dredges and trawls and are only used in sand.

Effects of trawls on major physical features in mud (deep-water clay-bottom habitats) and gravel bottom were described as permanent, and impacts to biological and physical structure were given recovery times of months to years in mud and gravel. Impacts of trawling on physical structure in sand were of shorter duration (days to months) given the exposure of most continental shelf sand habitats to strong bottom currents and/or frequent storms.

For scallop dredges in gravel, recovery from impacts to biological structure was estimated to take several years and, for impacts to physical structure, months to years. In sand, biological structure was estimated to recover within months to years and physical structure within days to months. Clam dredges are only used in sandy habitats where impacts to biological structure were estimated to last for months to years (depending on species composition) and impacts to physical structure, days to months.

Results of a comprehensive review of available gear effect publications that were relevant to the NE region of the U.S. are summarized in 9.3.1.2.4.2. Positive and negative effects of otter trawls, scallop dredges, and hydraulic clam dredges from 32 of these publications are listed by substrate type in Table 452 - Table 456 along with recovery times (when known). Without more information on recovery times, it is difficult to be certain which of the negative effects listed in these tables last for, say, more than a month or two. In fact, it is difficult to conclude in some cases (e.g., furrows produced by trawl doors) whether the habitat effect is positive, negative, or just neutral. Despite these shortcomings in the information, the scientific literature for the NE region does provide some detailed results that confirm the previous determinations of potential adverse impacts of trawls and dredges that were based on the ICES (2001), NRC (2002), and Morgan and Chuenpagdee (2003) reports.

Physical Effects	**Recovery**
Doors produce furrows/berms	2-18 months
Repeated tows increase bottom roughness	
Re-suspension/dispersal of fine sediments	
Rollers compress sediments	
Smoothing of surface features	
Biological Effects	
Reduced infaunal abundance	Within 3 ½ months (1 of 2 studies)
Reduced number of infaunal species	Within 3 ½ months
Reduced abundance of polychaete/bivalve species	Within 3 ½ months (1 of 2 studies)
Increased food value of sediments	
Increased chlorophyll production of surface sediments	
Removal/damage of epifauna	
Reduced abundance of brittlestars	
Increased number of infaunal species	
Increased abundance of polychaetes	
Decreased abundance of bivalves	
Altered community structure	18 months

Table 452 – Effects and Recovery Times of Bottom Otter Trawls on Mud Substrate in the Northeast Region as Noted By Authors of Eight Gear Effect Studies.

Physical Effects	Recovery
Doors produce furrows/berms	Few days – a year
Smoothing of surface features	Within a year
Re-suspension/dispersal of fine sediments	No lasting effects
Biological Effects	
Mortality of large sedentary and/or immobile epifaunal species	
Reduced density of attached macrobenthos	
Removal/damage of epifauna	
Reduced abundance of polychaetes	
Reduced abundance/biomass of epibenthic organisms	
Reduced biomass/average size of many epibenthic species	
Epifauna (sponges/anemones) less abundant in closed areas	

Table 453 - Effects and Recovery Times of Bottom Otter Trawls on Sand Substrate in the Northeast Region as Noted By Authors of Twelve Gear Effect Studies.

Physical Effects	Recovery
Displaced boulders	
Removal of mud covering boulders and rocks	
Groundgear leave furrows	
Biological Effects	
Reduced abundance of attached organisms (sponges, anemones, soft corals)	
Damaged sponges, soft corals, brittle stars	12 months

Table 454 – Effects and Recovery Times of Bottom Otter Trawls on Gravel and Rock Substrate in the Northeast Region as Noted By Authors of Three Gear Effect Studies.

Physical Effects	Recovery
Disturbed physical/biogenic structures	
Loss of fine surficial sediments	More than 6 months
Reduced food quality of sediments	Within 6 months
Biological Effects	
Reduction in total number of infaunal individuals	Within 6 months
Reduced abundance of some species (polychaetes/amphipods)	
Decreased densities of two megafaunal species	

Table 455 – Effects and Recovery Times of Chain Sweep Scallop Dredges on Sand Substrate in the Northeast Region as Noted By Authors of Three Gear Effect Studies.

Physical Effects	Recovery
Trenches/mounds along sides	1 day – 2 months or more
Fluidized sediments in trenches	More than 11 weeks
Re-suspension/dispersal of fine sediments	
Re-sorting of sediments in trench (coarse sediments at bottom)	Within 40 days
Increased turbidity	Minutes - hours
Biological Effects	
Reduction in total number of infaunal organisms	
Reduction in macrofaunal organisms	
Reduction in number of infaunal species	
Reduction in macrofaunal species/biomass (especially polychaetes)	

Table 456 – Effects and Recovery Times of Hydraulic Clam Dredges on Sand Substrate in the Northeast Region as Noted By Authors of Six Gear Effect Studies.

Given the evidence that there are potential adverse impacts of trawls on hard-bottom, sand, and mud habitats, of scallop dredges on hard-bottom and sand habitats, and of clam dredges on sand habitats in the NE region, the next step is to relate the intensity of fishing activity with each of these gear types to the distribution of these three substrates in the region. This comparison is over-simplified because it does not take into account other factors such as depth and the degree of natural disturbance, the quality of the sediment distribution is limited, and fishing activity is quantified by ten minute squares (TMS) of latitude and longitude. However, it generally indicates where within the region the adverse impacts of these three gears are concentrated.

The analysis in Section 9.3.1.2.3 indicates that the ten-minute-squares (TMS) that account for most of the bottom trawling in the region overlay a high percentage (>40%) of five different sediment types (Figure 252), even though most of the TMS are associated with sand since sand is the primary sediment type in the region. The results show that dredging is more closely related to sand (and less to the other sediment types) than trawling, but scallop dredges are used over a larger area than clam dredges and in a higher percentage of sand, gravelly sand, and gravel bottom areas. Bottom trawling during 1995-2001 was almost equally divided between the Gulf of Maine, Georges Bank, southern New England, and the Mid-Atlantic sub-regions, whereas scallop and clam dredging was more concentrated in the Mid-Atlantic (Figure 250). A significant amount of scallop dredging also took place on Georges Bank, likewise for clam dredging in southern New England. The frequency of scallop dredge activity increased relative to the amount of each sediment type present, with sediment grain size on Georges Bank and in the Mid-Atlantic (Figure 251). The same was true for clam dredges in the Mid-Atlantic and in southern New England.

The following conclusions can therefore be reached:

- Adverse and potentially adverse habitat impacts from bottom trawling occur throughout most of the NE region on a variety of substrates;
- Adverse and potentially adverse habitat impacts from scallop dredging occur primarily in the Mid-Atlantic and secondarily on Georges Bank on sand, gravelly sand, and gravel substrates;
- Adverse and potentially adverse habitat impacts from hydraulic clam dredging occur primarily in the Mid-Atlantic and secondarily in southern New England on sand substrates.

Based on these conclusions, bottom trawls are determined to have the largest adverse impact to benthic habitats in the NE region because they are used on more days at sea than dredges, and therefore affect a larger area of bottom, and because they affect a variety of substrates over a large area. It must be noted, however, that there is a large variety of bottom otter trawls that are designed to be used in specific bottom conditions to catch certain species, and that some of them affect benthic habitats more so than others. This conclusion therefore refers to bottom otter trawls in a generic sense. Scallop dredges (specifically, New Bedford style chain sweep dredges) rank second and have a larger impact than hydraulic clam dredges because they are affect a larger bottom area (larger fishing grounds and more bottom time), and their adverse effects are limited to sand and gravel substrates (not mud). Clam dredges only impact sandy substrates and are used in a much smaller area than scallop dredges or trawls.

9.3.1.8.4.3 Cumulative Impacts of All Three Gears

Because the potential adverse impacts of trawls and dredges are so similar (see Section 9.3.1.8.4.2) bottom otter trawls, scallop dredges, and clam dredges can be considered as a group and their cumulative effects as a function of the fishing activity of all three gears added together. In state waters, which are designated as EFH for one or more species in the multi-species assemblage, the cumulative effects of mobile, bottom-tending gear would also include adverse impacts from other types of dredges listed in Table 393. The combined effect of otter trawls, scallop dredges, and clam dredges was ranked considerably higher in gravel (and other hard-bottom habitats) than in sand (ranked second) and mud (ranked third)). Impacts on biological structure were considered to be more severe than impacts on physical structure, with removal of major physical features ranking third). A fourth effect, changes in benthic prey, was not adequately evaluated because there was not enough information available. Combined impacts to gravel and sand habitat were primarily to biological structure, with gravel ranking higher than sand. Impacts on physical structure were judged to be the same in gravel and sand. Impacts in mud ranked low, with removal of major physical structures scoring higher than impacts to physical and biological structure.

9.3.1.8.4.4 Species/Life Stages With Vulnerable EFH

A final step in the process of assessing the potential adverse impacts that was taken for this amendment is the determination of which of the 39 federally-managed species in the Northeast region have EFH which is vulnerable to the adverse impacts of otter trawls, scallop dredges, and clam dredges (Table 449). This evaluation was conducted by examining known life history information for each benthic life stage of these species that describes how habitat features such as three-dimensional structure and prey populations are affected by fishing activities for each gear type. Twenty-four species were determined to have EFH for at least one life stage that was moderately or highly vulnerable to the adverse effects of mobile, bottom-tending gear. Thirteen of the 15 species that are included in the multi-species assemblage were included in the list. Species and life stages that are not listed are adult and juvenile offshore hake, juvenile pollock, adult silver hake and white hake, juvenile winter flounder, and adult and juvenile windowpane. Assessments of habitat management measures that are intended to minimize the adverse impacts of fishing in this amendment/EIS should focus on the species and life stages.

The Council concurs with the EFH vulnerability determinations and has determined the following:

Notes: E = eggs lifestage, L = larvae lifestage, J = juvenile lifestage, and A = adult lifestage

Otter Trawls

The use of Otter Trawls may have an adverse effect on the following species (and life stages) EFH as designated in Amendment 11 to the Northeast Multispecies FMP (1998):

American plaice (Juvenile (J), Adult (A)), Atlantic cod (J, A), Atlantic halibut (J, A), haddock (J, A), ocean pout (E, L, J, A), red hake (J, A), redfish (J, A), white hake (J), silver hake (J), winter flounder (A), witch flounder (J, A), yellowtail flounder (J, A), red crab (J, A), black sea bass (J, A), scup (J), tilefish (J, A), barndoor skate (J, A), clearnose skate (J, A), little skate (J, A), rosette skate (J, A), smooth skate (J, A), thorny skate (J, A), and winter skate (J, A).

Scallop Dredge (New Bedford style)

The use of New Bedford style Scallop Dredges may have an adverse effect on the following species (and life stages) EFH as designated in Amendment 11 to the Northeast Multispecies FMP (1998):

American plaice (J, A), Atlantic cod (J, A), Atlantic halibut (J, A), haddock (J, A), ocean pout (E, L, J, A), red hake (J, A), redfish (J, A), white hake (J), silver hake (J), winter flounder (J, A), yellowtail flounder (J, A), black sea bass , (J, A), scup (J), barndoor skate (J, A), clearnose skate (J, A), little skate (J, A), rosette skate (J, A), smooth skate (J, A), thorny skate (J, A), and winter skate (J, A).

Hydraulic Clam Dredges

The use of Hydraulic Clam Dredges may have an adverse effect on the following species (and life stages) EFH as designatged in Amendment 11 to the Northeast Multispecies FMP (1998):

Atlantic cod (A), black sea bass (J, A), clearnose skate (J, A), little skate (J, A), ocean pout (E, L, J, A), red hake (J), rosette skate (J, A), scup (J), silver hake (J), winter flounder (A), winter skate (J, A), and yellowtail flounder (J, A).

Gear types other than otter trawls, scallop dredges and hydraulic clam dredges (in the context of the Northeast Multispecies fishery) were not found to have adverse effects the Essential Fish Habitat as currently designated in this region.

9.3.1.9 Non-Magnuson-Stevens Act Fishing Activities that may Adversely Affect EFH

There are a number of fishing activities that may adversely affect EFH that are not necessarily managed under the Magnuson-Stevens Act. For example, state fisheries, some recreational fisheries, subsistence fishing, and even research projects. When these activities are added together, they may have the potential to cumulatively impact habitat. It is difficult to keep track of every non-Magnuson fishing activity and measure all of these activities occurring along the coast, but the EFH Regional Steering Committee has gathered information about the various fishing gears used in the Northeastern United States and their potential effects on EFH. Table 457 describes the fishing gears used in estuaries and bays, coastal waters, and offshore waters of the EEZ from Maine to North Carolina. Notice the variety of gears used in state waters for non-Magnuson related fishing activities, and whether these gears come in contact with the bottom or not.

GEAR	Estuary or Bay	Coastal 0-3 Miles	Offshore 3-200 Miles	Contacts Bottom	Federally Regulated
Bag Nets	X	X	X		X
Beam Trawls	X	X	X	X	X
By Hand	X	X			X
Cast Nets	X	X	X		
Clam Kicking	X			X	
Diving Outfits	X	X	X		
Dredge Clam	X	X	X	X	X
Dredge Conch	X			X	
Dredge Crab	X	X		X	
Dredge Mussel	X	X		X	
Dredge Oyster, Common	X			X	
Dredge Scallop, Bay	X			X	
Dredge Scallop, Sea		X	X	X	X
Dredge Urchin, Sea		X	X	X	
Floating Traps (Shallow)	X	X		X	X
Fyke And Hoop Nets, Fish	X	X		X	
Gill Nets, Drift, Other			X		X
Gill Nets, Drift, Runaround			X		X
Gill Nets, Sink/Anchor, Other	X	X	X	X	X
Gill Nets, Stake			X	X	X
Haul Seines, Beach	X	X		X	
Haul Seines, Long	X	X		X	
Haul Seines, Long(Danish)		X	X	X	X

Table 457 - Fishing gears used in estuaries and bays, coastal waters, and offshore waters of the EEZ, from Maine to North Carolina. Includes all gear responsible for 1% or greater of any state's total landings and all gear that harvested any amount of federally managed species.
Entries in bold type are gears that are federally managed and contact the bottom
Based upon 1999 NMFS landings data and 2000 ASMFC Gear Report

GEAR	Estuary or Bay	Coastal 0-3 Miles	Offshore 3-200 Miles	Contacts Bottom	Federally Regulated
Hoes	X			X	
Lines Hand, Other	X	X	X		X
Lines Long Set With Hooks		X	X	X	X
Lines Long, Reef Fish		X	X	X	X
Lines Long, Shark		X	X		X
Lines Troll, Other		X	X		X
Lines Trot With Baits		X	X		X
Otter Trawl Bottom, Crab	X	X	X	X	
Otter Trawl Bottom, Fish	X	X	X	X	X
Otter Trawl Bottom, Scallop		X	X	X	X
Otter Trawl Bottom, Shrimp	X	X	X	X	X
Otter Trawl Midwater		X	X		X
Pots And Traps, Conch	X	X		X	
Pots and Traps, Crab, Blue Peeler	X	X		X	
Pots And Traps, Crab, Blue	X	X		X	
Pots And Traps, Crab, Other	X	X	X	X	X
Pots And Traps, Eel	X	X		X	
Pots and Traps, Lobster Inshore	X	X		X	
Pots and Traps, Lobster Offshore			X	X	X
Pots and Traps, Fish	X	X	X	X	X
Pound Nets, Crab	X	X		X	
Pound Nets, Fish	X	X		X	
Purse Seines, Herring		X	X		X
Purse Seines, Menhaden		X	X		
Purse Seines, Tuna		X	X		X
Rakes	X			X	
Reel, Electric or Hydraulic		X	X		X
Rod and Reel	X	X	X		X
Scottish Seine		X	X	X	X
Scrapes	X			X	
Spears	X	X	X		
Stop Seines	X			X	
Tongs and Grabs, Oyster	X			X	
Tongs Patent, Clam Other	X			X	
Tongs Patent, Oyster	X			X	
Trawl Midwater, Paired		X	X		X
Weirs	X			X	

Table 457 - Fishing gears used in estuaries and bays, coastal waters, and offshore waters of the EEZ, from Maine to North Carolina. Includes all gear responsible for 1% or greater of any state's total landings and all gear that harvested any amount of federally managed species

9.3.1.10 Non-fishing Related Activities that may Adversely Affect EFH

The Omnibus Habitat Amendment (1998), Amendment 11 to the Northeast Multispecies FMP, identified numerous potential non-fishing threats to essential fish habitat. The chemical, biological, and physical threats to riverine, inshore, and offshore habitats are extensively discussed in Section 5.2 of the Omnibus document. Overall, the major threats to marine and aquatic habitats are a result of increasing human population and coastal development, which is contributing to an increase of human generated pollutants. These pollutants are being discharged directly into riverine and inshore habitats by way of both *point* and *non-point* sources of pollution. Point sources of pollution include industrial discharge, power plants, sewage treatment plants, disposal of dredged materials, energy and mineral exploration, marine transportation, coastal and port development, and erosion. Non-point sources include run-off, wildlife feces, industrial shipping, recreational boating, septic systems, and contaminated groundwater and sediments. Table 458 summarizes the Non-Fishing Related Threats to EFH. Refer to Amendment 11 to the Northeast Multispecies FMP (1998) for a more complete discussion of these potential threats.

THREATS	Chemical												Biological			Physical																		
																								ero		dive			mini					
ACTIVITIES & SOURCES ("2°" ≡ secondary source)	oil	heavy metals	nutrients	pesticides	herbicides / fungicide	acid	chlorine	thermal	metabolic / food wastes	suspended particles	radioactive wastes	greenhouse gases	exotic / reared	nuisance / toxic algae	pathogens	channel dredge	dredge and fill	marina/dock construction	vessel activity	bulkheads	seawalls	jetties	groins	tidal restriction	dam	water withdrawal	irrigation	deforestation	gravel / mineral mining	oil / gas mining	peat mining	debris	artificial reefs	dredged material
non-point sources																																		
municipal run-off	X	X	X	X	X	X			X	X	X			X	X																	X		
agricultural run-off	X	X	X	X	X	X			X	X				X	X																			
atmospheric deposition		X	X	X	X	X				X	X	X																						
wildlife feces			X						X					X	X																			
septic systems			X				X		X					X	X																			
industrial shipping	X	X	X							X			X	X	X	X		X	X										X	X	X	X		X
recreational boating	X	X	X							X			X	X		X		X	X													X		X
contaminated groundwater		X	X	X	X	X	X				X			X																				
contaminated sediments	X	X	X	X							X			X																				X
nuisance / toxic algae (2°)			X						X						X																			
point sources																																		
industrial discharge		X	X			X	X	X	X	X	X			X																				
power plants	X	X					X	X			X														X									
sewage treatment plants			X			X	X		X					X	X																			
ocean disposal of dredged	X	X	X	X						X				X																				
aquariums			X										X		X																			
biotechnology labs													X		X																			
silviculture			X						X	X				X														X						
water diversion			X	X	X					X				X	X									X	X	X	X							
decaying shoreline																		X	X													X		
energy and mineral	X		X							X				X															X	X	X			X
marine transportation	X	X								X						X		X	X															X
coastal development			X	X	X											X	X	X	X	X	X	X	X	X	X	X	X	X						X
port / harbor development																X	X	X	X	X	X	X	X	X	X			X				X		X
erosion control										X										X	X	X	X	X	X									

Table 458 - Non-Fishing Related Threats to EFH and Activities and Sources Contributing the Threats

Source: Habitat Omnibus Amendment (1998)

9.3.2 Conservation and Enhancement

The Magnuson-Stevens Fishery Conservation and Management Act requires all fishery management plans (FMPs) to identify actions to promote the conservation and management of fishery resources. Prior to the concept of essential fish habitat (EFH), conservation primarily involved management measures to reduce overfishing and rebuild overfished stocks. The Habitat Omnibus Amendment (1998) strengthened the role of the New England Fishery Management Council to further conserve and enhance EFH and related fishery resources. Section 6.0 of the EFH Amendment describes options to avoid, minimize, or compensate for the adverse effects of activities identifies as non-fishing threats to essential fish habitat.

The conservation and enhancement options promoted by the Council include, as directed in the Interim Final Rule: the enhancement of rivers, streams, and coastal areas; improving water quality and quantity; watershed analysis and planning; and habitat creation. The Habitat Omnibus Amendment detailed recommendations to address fishing threats including chemical, biological, and physical threats. Furthermore, the state, non-profit, and other federal agencies that are working with the Council to develop programs to monitor and research habitat are highlighted in that document as well.

9.3.3 Prey Species

Appendix A of the Habitat Omnibus Amendment (1998) describes the life history and habitat characteristics of all Council-managed species. The abundance of major prey items in the diet of these managed species are listed within the Appendix, which are based on the NEFSC bottom trawl survey data. This information is important to consider when analyzing prey species and essential fish habitat, however existing law does not require the Council to define prey species as EFH. Technical guidance from NOAA general counsel encouraged the Councils to identify the prey species for the species managed under the FMP and describe the habitat of those significant prey species to aid in the determination of adverse effects to their habitat. This information should be included in the “adverse effects” section of the EFH FMP, rather than the description and identification section. Therefore, the Habitat Omnibus Amendment is sufficient to date, and the EFH Source Documents should be referred to when evaluating adverse effects of EFH (Appendix A of EFH Amendment).

9.3.4 Research and Information Needs

The regulatory text of the EFH Final Rule directs the Council to include in the EFH amendment recommendations, preferably in priority order, for research efforts that the Council and NMFS view as necessary for carrying out their EFH management mandate. The need for additional research is to make available sufficient information to support a higher level of description and identification of EFH. Additional research may also be necessary to identify and evaluate actual and potential adverse effects on EFH including, but not limited to, direct physical alteration, impaired habitat quality/functions, cumulative impacts from fishing, or indirect adverse effects such as sea level rise, global warming and climate shifts, and non-equipment related fishery impacts. The need for additional research on the effects of fishing equipment on EFH is also included. The research needed to quantify and mitigate adverse effects on EFH is identified in this amendment as well.

The Council hopes to coordinate with NMFS in identifying research priorities for EFH; therefore, the Council supports the recent work compiled by the Northeast Region EFH Steering Committee (2000). 9.3.4 is the result of what the EFH Steering Committee discussed related to habitat research needs. Five major research categories were identified: habitat characterization needs, gear impacts, specific habitat studies, data collection needs, and anthropogenic impacts. Research priority is given when appropriate, and potential funding sources are identified as well. The Habitat Technical Team recognizes that all research priorities are important, but the cost and length of a project are critical factors in determining its overall priority. The length of recovery for a specific habitat type may be a realistic goal for short-term research, but until a determination is made on how fish are linked to these habitats, management will not benefit from these projects. The Council's EFH Technical Team identified high-resolution mapping of the ocean floor as the research need with the highest benefit to EFH research, but is also the most expensive. It is important for the Council to assist the research community to identify what habitat research is currently taking place, so future research can be directed to complete these projects into one integrated EFH dataset for the Northwest Atlantic.

Research Category	Research Need	Priority	Potential Funding Source	Council/ ASMFC Interest
Habitat Characterization Needs	Provide high resolution benthic/sediment mapping of mid-Atlantic and New England areas # Identify and describe biogenic structure and biological communities associated with different physical habitat types # Develop mechanism for fishing industry-supported, high resolution sediment mapping in the Gulf of Maine and Georges Bank. Use Canadian sea scallop industry mapping effort as an example to establish process for similar mapping efforts in U.S. waters	HIGH HIGH HIGH	Examples - NOAA (Habitat Characterization Initiative?), NMFS, Sea Grant, Councils NE Cooperative Research Funds	All All NEFMC
	Identify nursery and overwintering habitats for black sea bass	HIGH	MAFMC-TAC	MAFMC ASMFC
	Identify nursery and overwintering habitats for scup	Med.	MAFMC-TAC	MAFMC ASMFC
	Identify Loligo squid spawning areas	Med.	MAFMC-TAC	MAFMC
	Identify dogfish pupping areas	Med.	MAFMC-TAC	All
	Identify Atlantic herring spawning areas	Med.		NEFMC ASMFC
	Identify spring spawning bluefish areas in South Atlantic Bight	Low		MAFMC ASMFC
	Refine identification of summer flounder nursery habitat	Low		MAFMC ASMFC
Gear Impacts	Assess effects of specific mobile bottom gear types along a gradient of effort, on specific habitat types # Effects on tilefish burrows # Effects on Loligo egg mops # Effects on soft muddy bottom communities # Identify and compare/contrast impacts to a variety of habitat types (mud, sand, gravel, cobble, rock, boulder) associated with the various fishing gear types used in New England and Mid-Atlantic fisheries # Explore options for the development of new otter trawl, scallop and clam dredge, and other fishing gear designs that have less contact and impact on the benthos than current fishing gear designs	HIGH HIGH HIGH HIGH HIGH Med.	NOAA, MAFMC, NEFMC	All MAFMC MAFMC NEFMC All All
	Effects on ecosystems as compared to other anthropogenic impacts and natural perturbations # Identify and establish baseline sites throughout the New England and Mid-Atlantic regions where fishing effort has been minimal	HIGH HIGH	Cooperative Research Funding	NEFMC MAFMC All
	Determine recovery rates for various habitat types	HIGH		All

Table 459 - Essential Fish Habitat Research Needs (Identified by the EFH Steering Committee)

Research Category	Research Need	Priority	Potential Funding Source	Council/ ASMFC Interest
Gear Impacts (cont.)	Identify fishing grounds and SAV distributions to locate where the two overlap and identify the changes in beds over time	Med.		MAFMC ASMFC
	Effects of dredging for surf clams and ocean quahogs	Med.		NEFMC MAFMC
	Effects of ghost fishing gear	Low		MAFMC ASMFC
Specific Habitat Studies	Determine the functional value of various habitat types	HIGH		All
	# Distribution and value of relic shoal habitat along the mid-Atlantic coast	HIGH		MAFMC
	# Investigate the conditions and benthos that contribute to groundfish settlement and recruitment. Identify the areas where this happens with some regularity	HIGH		NEFMC MAFMC
	# Relationship between SAV and environmental quality of fish habitat and relative importance of SAV to other habitat types	Med.		All
	# Role of artificial fish habitats, both intentional and accidental, in the health of fishery species	Med.		All
	# Importance of "open sand bottoms" in shallow areas for various fish	Low		MAFMC ASMFC
	# Tagging/in situ observations to estimate habitat home range of species at critical life stages	Low		All
Data Collection Needs	Develop a reporting system and/or expand vessel tracking system to collect high resolution data on the distribution of fishing effort	HIGH	NMFS	All
Anthropogenic Impacts (non-fishing)	Effects on fish communities due to alterations to mud flat habitats	Med.		All
	Identify impediments to anadromous and catadromous fish passage on rivers and assess their impacts	Med.		All
	Effects of power plants on fish populations due to habitat change, entrainment and impingement	Low		All

Table 459 - Essential Fish Habitat Research Needs (Identified by the EFH Steering Committee)(cont.)

9.3.5 Identification of HAPCs

This review will take place during the next Habitat Omnibus Amendment scheduled to be completed in 2004. The process for considering new HAPC proposals is outlined in the Council's Habitat Annual Review and Report of 2000. This process will be followed during the next Omnibus Amendment.

9.3.6 Review and Revision of EFH Components of FMPs

The Council conducts a review of EFH designations at least once every five years, and this will take place during the upcoming Habitat Omnibus Amendment 2.

9.4 Human Environment

9.4.1 Overview of Affected Human Environment Section

The Affected Human Environment section describes the New England multispecies fishery from 1994 to the present, examining how management actions and changes in fishing activity have shaped the fishing industry and fishing communities over time. Social, economic and fishery information presented in this section are useful in describing the response of the fishery to past management actions and predicting how the present action may affect the multispecies fishery. Additionally, this section of the document establishes a descriptive baseline for the fishery with which to compare actual and predicted future changes that result from management actions. For a complete discussion of prior management actions leading up to Amendment 13, refer to section 0, "Brief History of Prior Management Actions."

This information helps to meet the legal requirements of the Council under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the National Environmental Policy Act (NEPA), and other applicable laws. Specifically, it addresses National Standard 8, established in a 1996 amendment to the Magnuson-Stevens Act. National Standard 8 of the MSFCMA states that: *Conservation and management measures shall, consistent with the conservation requirements of this act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (a) provide for sustained participation of such communities, and (b) to the extent practicable, minimize adverse economic impacts on such communities.*

National Standard 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. "Sustained participation" is interpreted as continued access to the fishery within the constraints of the condition of the resource.

NEPA requires federal agencies to consider the interactions of natural and human environments and the impacts on both systems of any changes due to governmental activities or policies. This analysis should be done by means of "a systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences ... in planning and decision-making" [NEPA section 102(2)(a)]. Environmental values must be considered and weighed on par with technical and economic considerations. Environmental values include angler satisfaction, job satisfaction, an independent life-style for commercial fishermen, and the opportunity to see species in the wild for the non-consumptive user of marine fishery resources.

NEPA specifies that the term *human environment* shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment [40 CFR 1508.14]. When analyses predict that a fishery management action or policy will have a *significant* effect on the human environment, a detailed Environmental Impact Statement (EIS) with analysis of these impacts must be prepared. Amendment 13 addresses this requirement with a complete, detailed EIS.

A full range of impact assessments – ecological, economic, and social – are necessary not only to meet MSFCMA and NEPA requirements, but also to improve the Council's decision-making process. The following discussion provides a useful tool for assessing the environmental impacts of Amendment 13 and the cumulative effects of past, present and future management actions.

The Affected Human Environment section is organized in the following format:

Section 9.4.2 - Commercial Harvesting Sector
This section describes the composition of the fleet in terms of permit category, gear type, vessel size, and home port state. Discussion of the multispecies fishery focuses primarily on the years 1996 through 2001, inclusive. Because of their significant effects on the multispecies fishery, Amendments 5 (1994) and 7 (1996) to the multispecies plan are used as historical markers to frame the discussion of the commercial harvesting sector.

Section 9.4.3 - Recreational Harvesting Sector
The recreational harvesting sector, which comprises both individual anglers and charter/party boats, is described independent of the commercial sector. While the recreational sector is increasing in magnitude within the multispecies fishery, it cannot be analyzed in conjunction with the commercial sector because of differences in the way landings data are reported and managed. The recreational catch is composed primarily of cod, haddock and winter flounder. Pollock, other flounder and hake contribute to a less substantial portion of the recreational catch.

Section 9.4.4 - Wholesale Trade and Processing Sector
This section describes the processing sector, distinguishing between the fresh fish processing and frozen fish processing industries. In addition, it includes information on wholesale firms, which do not process fish but buy from processors and sell to retail outlets, institutions, and other consumers.

Section 9.4.5 - Fishing Communities
In this amendment, coastal communities throughout the northeast region are organized into primary and secondary *port groups* based on participation in the groundfish fishery since the 1994 fishing year. This section includes landings and revenues information by community group as well as social and demographic statistics compiled by the Census Bureau for counties.

9.4.2 Commercial Harvesting Sector

9.4.2.1 Characterizing the Commercial Fishery as a Whole

The multispecies fishery in the Northeastern United States is made up of a commercial sector and a recreational sector, which target the twelve species that constitute the large-mesh multispecies management unit and the three small-mesh species managed as a separate multispecies unit. Fishery information in this section reflects ten of the twelve large-mesh species, excluding ocean pout and Atlantic halibut.

Total and groundfish (large-mesh regulated multispecies) landings have generally demonstrated a positive trend from 1994 to 2001 (Table 460). Total landings by multispecies vessels increased an average of approximately 4.3% each year from 1994 to 2001, while groundfish landings increased, on average, 5.3% annually during that period. Groundfish landings fluctuated between 1994 and 2001, decreasing about 10% from 1994 to 1995, increasing slightly from 1996 to 1997, decreasing to a small extent in the following two years, and increasing again approximately 45% from 1999 to 2001.

	1994	1995	1996	1997	1998	1999	2000	2001
Total Landings, **all species**	418,071	438,497	453,540	528,788	522,683	467,931	486,302	550,562
Total Landings, **groundfish only**	75,334	67,779	72,384	72,734	71,649	71,517	90,775	104,325
Total Revenues, **all species**	$361,479	$348,628	$339,489	$327,839	$318,870	$382,718	$405,996	$389,118
Total Revenues, **groundfish only**	$94,025	$85,503	$82,444	$82,244	$87,614	$87,615	$95,306	$99,740

Table 460 - Landings (thousands of pounds) and revenues (thousands of 1999 dollars) of multispecies vessels, 1994-2001

Data are for multispecies permit holders only. Data reported by fishing year – May 1 to April 30. Revenues expressed in 1999 dollars. Data Source: NMFS Dealer database.

Total revenues trends did not closely mimic total landings trends across all years (Figure 253). From 1994 to 1997 and 2000 to 2001, total landings increased while revenues decreased because low-value small non-multispecies comprised an increasing proportion of the total landings while the proportion of high-value species decreased across both time periods. Where the opposite occurred from 1998 to 1999, the proportion of high-value species increased while that of low-value small non-multispecies decreased. Total revenues were somewhat variable throughout the time period, decreasing from 1994 to 1998, increasing an average of 13% per year from 1998 to 2001, and decreasing about 4% from 2000 to 2001. Trends in groundfish revenues generally reflect groundfish landings trends. Groundfish revenues decreased between 1994 and 1996 then generally trended upwards between 1996 and 2001, although they did not demonstrate increases greater than about 8% between any two consecutive years.

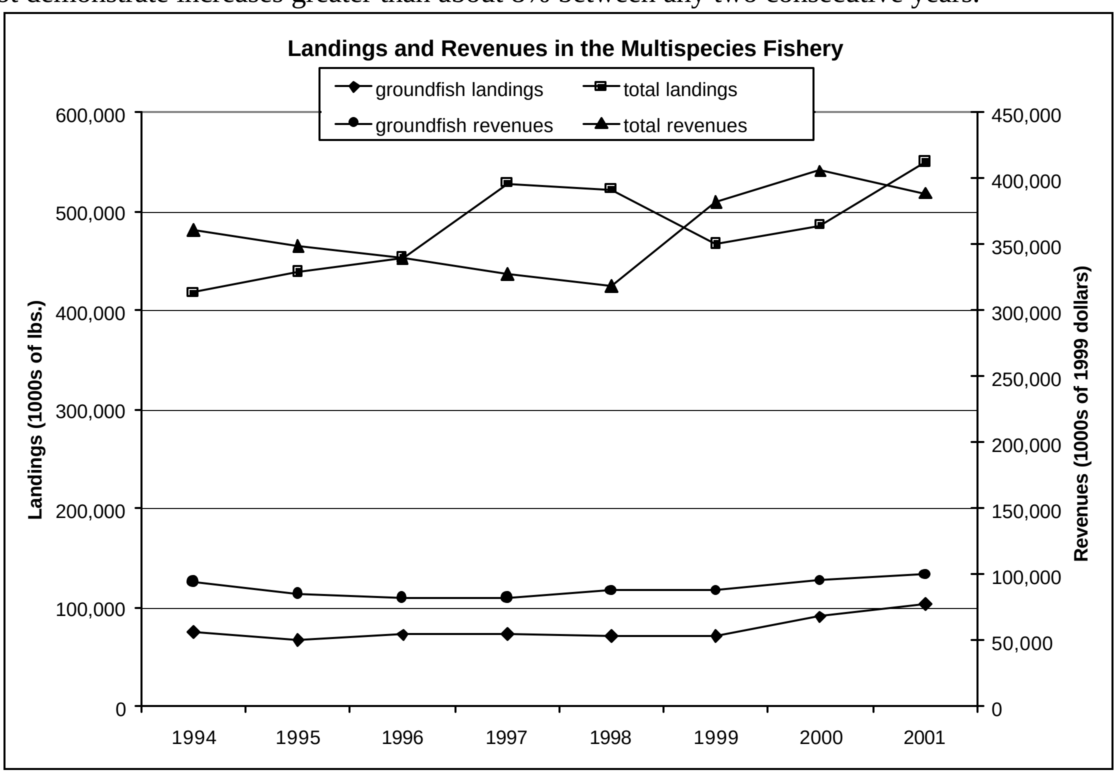


Figure 253 – Landings and Revenues in the Multispecies Fishery, 1994-2001

Fleet Composition
The total number of multispecies permits declined from 1996 to 1998 but increased in later years, returning to nearly its 1996 level by 2001. Since 1996, open access permits have made up the greatest proportion of total multispecies permits. From 1996 to 2001, the highest total landings were brought in by Fleet DAS and Open Access vessels. Across all years, Individual DAS vessels were more financially dependent on groundfish than vessels in other permit categories. This is also reflected in day-at-sea use by Individual DAS vessels, which used the greatest percentage of their allocated category DAS in each year from 1996 to 2001. In general, while numbers of individual, fleet and small vessel exemption permits declined from 1996 to 2001, numbers of hook gear, large mesh fleet and open access permits increased. Combination vessel and large mesh individual permits remained relatively constant across the time period.

The multispecies fleet is composed primarily of small to medium-sized vessels. Vessels from 30 to 50 feet have consistently made up the greatest proportion of multispecies vessels from 1994 to 2001. In general, the number of smallest vessels has diminished most substantially, demonstrating the greatest percent declines from 1994 to 2001, particularly in the periods directly following Amendments 5 and 7. The smallest vessels, while contributing the least groundfish landings in all years from 1994 to 2001, demonstrated the greatest average annual percent increases from year to year during this time period, particularly after 1999. In general, larger vessels have home ports in southern states and at the southern range of mid-Atlantic states (North Carolina, Virginia, Florida) while smaller vessels reside in the northern Atlantic states (Massachusetts, New Hampshire, Maine).

The number of multispecies vessels active in the groundfish fishery as a percentage of total active multispecies vessels indicates that a substantial amount of latent effort exists in the fishery. In 2001, there were nearly three times more multispecies permits than vessels which actually reported landings of groundfish. The number of active groundfish vessels has generally remained steady from 1996 to 2001. Many changes in distribution of landings among permit categories represent shifts in participation across categories rather than extensive movement in and out of the fishery entirely.

An investigation of the non-multispecies permits held by multispecies permit holders demonstrates that squid/mackerel/butterfish, lobster and scallop fisheries have been important fisheries to multispecies vessels which have sought diversification as a means of supplementing their income obtained from groundfish since 1994.

Bottom trawls were the top gear indicated as primary gear type from 1995 to 2001, followed by hook and line vessels and sink gillnets, the majority of these day boats. Between 1994 and 2001, bottom trawls accounted for a large majority of total and groundfish landings in each year. Total bottom trawl landings decreased overall from 1994 to 2001 primarily as a result of restrictions in other fisheries, evident in the fact that groundfish landings by bottom trawls increased over this time period. Following bottom trawls, the next four top contributors to total landings were "other" gears, sink gillnets, scallop dredges, and midwater trawls. Bottom longlines, which ranked third in contribution to groundfish landings, exhibited the greatest percent decline in landings of any of the gears. Hook and line groundfish landings exhibited a dramatic increase from 1996 to 2001. DAS use increased from 1996 to 2001 for each of the four primary gear types. Bottom trawls used the greatest percentage of allocated DAS from 1996 to 2001, while hook and line vessels utilized the smallest percentage of days allocated.

Fleet composition by state has remained relatively consistent for both active multispecies vessels in all fisheries and active multispecies vessels in the groundfish fishery from 1996 to 2001. The multispecies fleet is dominated by vessels with home ports in Massachusetts and Maine. Massachusetts vessels dominated all limited access permit categories throughout the period. From 1996 to 2001, the percent of Category A (Individual DAS) vessels from Massachusetts decreased slightly while increasing slightly in

Maine. New Hampshire also increased participation in this permit category. The number of Massachusetts vessels in the largest permit category, Category B (Fleet DAS), remained fairly constant from 1996 to 2001. Maine, Rhode Island and New York vessels together with those from Massachusetts made up the majority of this category over the time period. Vessels in combined open access categories were distributed more evenly among states than vessels in limited access categories.

Total and groundfish landings were highest for Massachusetts vessels in all years from 1996 to 2001. Total landings in Massachusetts, Rhode Island and New Jersey, the three highest contributing states to total landings, declined in the late '90s. Groundfish landings were highest in Massachusetts and Maine from 1996 to 2001, generally decreasing from the mid- to late-1990s. Groundfish landings in both states increased in the later years of the time period. Permitted multispecies vessels with home ports in some southern New England and mid-Atlantic states, though contributing a high percentage of landings to the total, are less active than Maine and New Hampshire vessels in the groundfish fishery. Those states may be more dependent on non-groundfish fisheries such as scup, squid, mackerel and butterfish. Maine and Massachusetts are clearly the largest stakeholders in the New England groundfish fishery with highest groundfish landings and revenues from 1996 to 2001. In examining groundfish revenues as a percentage of total revenues, however, New Hampshire fisheries are most heavily dependent on groundfish, followed by those in Maine.

All of the New England states increased their use of allocated DAS after Amendment 7 (1996). Active vessels in Maine and New Hampshire have used a higher percentage of allocated DAS than vessels in other states since 1997. Active vessels in New York and New Jersey have used a lower percentage of allocated DAS than vessels in other states since 1997.

9.4.2.2 Predictability of Landings and Revenues

An analysis was conducted in Amendment 7 (1996) that predicted landings and revenues of the large mesh species (groundfish) and the combined cod-haddock-yellowtail group from 1996 to 2005. The observed landings fell within the 95% confidence interval for predicted landings in every year from 1996 to 2000 (Table 461).

	1996	1997	1998	1999	2000
5% level	63,700	49,500	60,200	70,800	83,900
Observed	72,514	72,935	71,793	71,100	90,036
95% level	92,400	73,600	97,500	121,700	142,800

Table 461 - Total landings (in thousands of pounds) of regulated large mesh species from Amendment 7 analyses. Predicted values (at the 5th and 95th percentile) vs. observed, 1996-2000

Data are for multispecies permit holders only. Data reported by fishing year – May 1 to April 30. Data Source: NMFS Dealer Database and Amendment 7 to the Northeast Multispecies Fishery Management Plan.

Combined cod-haddock-yellowtail landings fell within the 95% confidence interval for predicted landings in every year since implementation of Amendment 7 except for 1997, when the observed landings exceeded the 95% level by almost 10 million pounds (Table 464). Mortality objectives may not have been met in 1997.

	1996	1997	1998	1999	2000
5% level	24,700	13,600	19,000	24,400	30,900
Observed	33,565	33,232	33,616	36,366	47,754
95% level	37,800	23,400	35,300	46,300	57,700

Table 462 - Total landings (in thousands of pounds) of combined cod-haddock-yellowtail from Amendment 7 analyses. Predicted values (at the 5th and 95th percentile) vs. observed, 1996-2000

Data are for multispecies permit holders only. Data reported by fishing year – May 1 to April 30. Data Source: NMFS Dealer Database and Amendment 7 to the Northeast Multispecies Fishery Management Plan.

Total revenues observed for the years 1996 and 1998 through 2000 fell within the 95% confidence interval for revenues predicted in Amendment 7 (Table 463). The observed revenue for 1997 exceeded the 95% confidence level by nearly 10 million dollars.

	1996	1997	1998	1999	2000
5% level	$64,239	$53,401	$61,981	$70,900	$70,300
Observed	$82,020	$82,628	$87,594	$86,719	$93,428
95% level	$84,560	$72,819	$92,124	$107,366	$107,000

Table 463 - Total gross revenue (in thousands of dollars) of regulated large mesh species from Amendment 7 analyses. Predicted values (at 5th and 95th percentile) vs. observed, 1996-2000

Data are for multispecies permit holders only. Revenues expressed in 1999 dollars. Data reported by fishing year – May 1 to April 30. Data Source: NMFS Dealer Database and Amendment 7 to the Northeast Multispecies Fishery Management Plan.

Combined cod, haddock and yellowtail revenues exceeded the predicted range in 1997, 1998 and 2000 (Table 464). These divergences may have resulted from price assumptions used in the model which were based on landings lower than those predicted in 1997. Prices were calculated *ex post facto* for this analysis from the observed landings and revenues in 1996 through 2000 (Table 465). The price reached a period high of $1.32 in 1998.

	1996	1997	1998	1999	2000
5% level	$28,224	$18,289	$23,596	$29,240	$30,700
Observed	$36,966	$38,738	$44,416	$47,064	$53,657
95% level	$40,643	$28,902	$39,966	$49,110	$51,900

Table 464 - Total revenues (in thousands of dollars) of combined cod-haddock-yellowtail from Amendment 7 analyses. Predicted values (at 5th and 95th percentile) vs. observed, 1996-2000

Data are for multispecies permit holders only. Revenues expressed in 1999 dollars. Data reported by fishing year – May 1 to April 30. Data Source: NMFS Dealer Database and Amendment 7 to the Northeast Multispecies Fishery Management Plan.

	1996	1997	1998	1999	2000
Average Price	$1.10	$1.17	$1.32	$1.29	$1.12

Table 465 - Average price per pound of combined cod-haddock-yellowtail based on total group revenue and landings from Dealer database, 1996-2000

Data are for multispecies permit holders only. Revenues expressed in 1999 dollars. Data reported by fishing year – May 1 to April 30. Data Source: NMFS Dealer Database

The analytical model used to generate these data was generally successful at predicting groundfish landings with 95% confidence but predicted revenues less accurately. For both total groundfish and combined cod, haddock and yellowtail revenues, the observed values in some years exceeded the predicted range. This may have resulted from certain assumptions used in the model.

9.4.2.3 AHE Data Caveats

Data Sources
NMFS Dealer Database
NMFS Permit Database
NMFS Enforcement Database

Reported Numbers of Vessels
When evaluating the number of vessels reported in any given table in the following sections it is necessary to understand exactly which vessels those numbers represent. Depending on the way in which the data were queried, a different number of vessels will emerge. In each of the following sections, there are two tables describing the number of vessels active in the multispecies fishery. The first is associated with total landings by permitted multispecies vessels. In this table, the number given for each fishing year is the quantity of vessels which possess multispecies permits and were active in *any* fishery, which may or may not include the regulated multispecies fishery, in that given fishing year. The second table is associated with groundfish landings only. In this table, the number given for each fishing year is the quantity of vessels which possess multispecies permits and were active in the *groundfish* fishery, having landed at least one pound of regulated groundfish, in that given fishing year. The total number of active vessels with multispecies permits that land *any* species is not equal to the total number of vessels with multispecies permits, because some of these permitted vessels may not be active in any fishery in a given fishing year. This value, the total number of active and inactive vessels with multispecies permits, is discussed in Section 9.4.2.4.1, Fishing Activity by Permit Category. In all sections, the fishing activity discussed is associated only with vessels that hold a multispecies permit--one large-mesh limited access multispecies permit *OR* one or more open access multispecies permits.

Permit Categories
The permit categories referred to in Section 9.4.2.4.1 are those established in Amendment 7 (1996). Revenue is reported as gross revenue and does not take into account the changes in fixed and operating costs over time (net revenue). Landings and revenue data for charter/party vessels are not discussed in conjunction with other commercial sector permit categories since charter/party landings are reported in number of fish, rather than weight.

9.4.2.4 Fishing Activity in the Commercial Harvesting Sector

Since the implementation of Amendment 5 in 1994, some major additions to the existing management plan have included a days-at-sea program to control effort, large year-round and seasonal closed areas, trip limits, and inshore rolling closures. The following four sections examine changes in fishing activity within the commercial harvesting sector resulting from these management actions over time. The commercial harvesting sector may be described as a function of its multiple components, including gear types, vessels, and communities. In this section, activity in the commercial sector is characterized in terms of **permit category**, **vessel length class**, **gear type** and **home port state**. Because of the way in which the data is queried for each of these descriptive approaches, total numbers of vessels, landings and revenues may differ slightly among the four sections. Where such anomalies occur, we have attempted to provide a clear explanation. The *Data Caveats* section at the beginning of each discussion also provides important information regarding these data.

9.4.2.4.1 Fishing Activity by Permit Category

Under Amendment 7 the following permit categories were created:

A Individual DAS
B Fleet DAS
C Small vessel exemption
D Hook gear
E Combination vessel
F Large mesh individual DAS
G Large mesh fleet DAS

H Handgear
I Charter/Party
J Scallop multispecies possession limit
K Non-regulated species

A-G are limited access multispecies permit categories, described in CFR 648.82. H-K are open access multispecies permit categories, described in CFR 648.88.

The limited access permit categories are briefly described below. For a complete discussion of how DAS were allocated to vessels in each category, refer to Amendment 7.

Limited Access Permit Categories

(A) Individual DAS:

Individual DAS vessels are subject to DAS restrictions. Any vessel issued a valid Individual DAS permit as of July 1, 1996 (except those that were issued a gillnet permit) was assigned to the Individual DAS category in Amendment 7.

(B) Fleet DAS:

Fleet DAS vessels are subject to DAS restrictions. Any vessel issued one of the following permits as of July 1, 1996 was assigned to the Fleet DAS category in Amendment 7: Fleet DAS permit, Gillnet permit, limited access Hook-Gear permit, "Less than or equal to 45 ft (13.7 m)" permit to a vessel larger than 20 ft (6.1 m) in length as determined by its most recent permit application.

(C) Small Vessel Exemption:

Small vessel category vessels may retain up to 300 lb (136.1 kg) of cod, haddock, and yellowtail flounder, combined, and one Atlantic halibut per trip without being subject to DAS restrictions. These vessels are not subject to possession limits for other NE multispecies. Any vessel that has a valid limited access multispecies permit, was fishing with a small vessel category permit (less than or equal to 45 ft (13.7 m)) as of July 1, 1996, and is 20 ft (6.1 m) or less in length as determined by the vessel's last application for a permit, was assigned to the small vessel category in Amendment 7.

(D) Hook-gear:

Hook gear vessels are subject to DAS restrictions. Each hook-gear vessel is limited to 4,500 rigged hooks and is prohibited from possessing gear other than hook gear on board.

(E) Combination vessel:

Combination vessels are subject to DAS restrictions. A vessel issued a valid limited access multispecies permit and qualified to fish as a combination vessel as of July 1, 1996 was assigned to the Combination vessel category in Amendment 7.

(F) Large Mesh Individual DAS:
Large mesh individual DAS vessels are subject to DAS restrictions. Large Mesh Individual vessels are required to fish for the entire year with either gillnet gear with a minimum size of 7-inch (17.78 cm) diamond mesh or with trawl gear with a minimum size of 8-inch (20.32 cm) diamond mesh in order to remain in this category.

(G) Large Mesh Fleet DAS:
Large mesh fleet DAS vessels are subject to DAS restrictions. Large Mesh Fleet vessels were required to fish with either gillnet gear with a minimum size of 7-inch (17.78-cm) diamond mesh or trawl gear with a minimum mesh size of 8-inch (20.32-cm) diamond mesh.

Open Access Permit Categories
(H) Handgear permit:
A vessel with a valid open access multispecies handgear permit is allowed to possess and land up to 300 lb (136.1 kg) of cod, haddock, and yellowtail flounder, combined, one Atlantic halibut per trip, and an unlimited quantity of the other NE multispecies, provided that the vessel did not use or possess on board gear other than rod and reel or handlines while in possession of, fishing for, or landing NE multispecies, and provided it has at least one standard tote on board. A Handgear permit vessel may not fish for, possess, or land regulated species from March 1 through March 20 of each year.

(I) Charter/party permit:
Any charter/party permit category vessel is subject to restrictions on gear, recreational minimum fish sizes, possession limits, and specified prohibitions on sale.

(J) Scallop multispecies possession limit permit:
A vessel that has been issued a valid open access scallop multispecies possession limit permit may possess and land up to 300 lb (136.1 kg) of regulated species when fishing under a scallop DAS, provided the vessel does not fish for, possess, or land haddock from January 1 through June 30 and provided the vessel has at least one standard tote on board.

(K) Non-regulated multispecies permit:
A vessel issued a valid open access, non-regulated multispecies permit may possess and land one Atlantic halibut and an unlimited quantity of the other non-regulated multispecies. The vessel is subject to restrictions on gear, area, and time and other restrictions.

Amendment 7 permit categories *replaced* those established in Amendment 5 (1994), listed below:

Limited Access Permit Categories
1. Individual DAS
2. Fleet DAS
3.Vessels 45 feet or less in length
4. Hook gear only
5. Combination vessel
6. Gillnet vessel

Open Access Permit Categories
7. Hook gear only

8. Possession limit

Data Caveats

Number of vessels, landings and revenues are reported by permit category for the years 1996 to 2001. General landings trends are discussed for the years 1994 and 1995. Data for these years by permit category will be included in the Final EIS for Amendment 13.

Since an individual may possess more than one open access permit, the open access categories (except charter/party) were combined with permit records that were not associated with actual landings eliminated to produce a mutually exclusive list of vessels associated with open access permits. The Charter/Party permit category is discussed in the Recreational Harvesting Sector section of the document. Multispecies permit holders may either possess only one limited access multispecies permit and *no* open access multispecies permits **OR** one or more open access multispecies permits.

Number of Vessels by Permit Category

The total number of permits is separated into the seven limited access permit categories below (Table 466). Open access categories were combined and are reported as a single value for each year. "Unknown" is listed for vessels which did not report a permit category. The total number of permits with unknown permit category was highest in 1996 (26.8% of total multispecies permits) most likely because it was the first year in which vessels were transitioning into the new Amendment 7 permit categories. These vessels with unknown permit category will be discussed minimally. From 1997 to 2001, "unknown" permits made up an average of 7.3% of the total.

The total number of multispecies permits decreased from 4,298 permits in 1996 to 3,541 permits in 1998, a decline of 17.6%. After 1998, this number increased an average of 4.7% per year, from 3,541 permits in 1998 to 4,066 in 2001. For all years after 1996 open access vessels make up the greatest percentage of total vessels, increasing from 32.1% in 1996 to 52.6% in 2001 with an average of 45.8% across the time period. *The open access category is expanding, having increased an average of nearly 10% each year from 1996 to 2001.*

Fleet vessels make up the greatest proportion of limited access vessels, averaging 75.5% of the total (not including open access boats). This proportion of all limited access vessels has decreased from 78.8% in 1996 to 73.2% in 2001. Vessels with hook gear permits make up the second greatest number of limited access vessels in all years after 1996, with a mean of 10.8% of the total number of limited access multispecies permits over the time period. The number of hook gear permits increased until 1998 and subsequently decreased. Individual permits composed the second greatest number of limited access permits in 1996 and the third greatest number of limited access permits in following years, averaging 8.6% of the total from 1996 to 2001. Individual permits dropped from 9.4% of the number of limited access multispecies permits in 1997 to 8.6% of this number in 2001.

In general, while numbers of individual, fleet DAS, and small vessel exemption permits declined from 1996 to 2001, numbers of hook gear, large mesh fleet DAS and open access permits increased. Combination vessel and large mesh individual DAS permits remained relatively constant across the time period.

Permit Category	1996	1997	1998	1999	2000	2001
Individual DAS	160	167	135	136	134	140
Fleet DAS	1,390	1,339	1,244	1,258	1,245	1,194
Small Vessel Exemption	16	16	12	15	14	10
Hook Gear	141	195	197	198	186	176
Combination Vessel	48	46	44	43	47	47
Large Mesh, Individual DAS	0	2	1	1	2	2
Large Mesh, Fleet DAS	10	16	18	19	27	62
Open Access Combined	1,381	1,740	1,628	1,777	1,971	2,140
Unknown Category	1,152	281	262	267	275	295
Total	**4,298**	**3,802**	**3,541**	**3,714**	**3,901**	**4,066**

Table 466 - Total number of multispecies vessels by permit category, 1996-2001
Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

The numbers discussed above represent only the number of total multispecies permits in the fishery, and do not differentiate between active and inactive (latent) permits. Table 467 shows the permitted multispecies vessels that are active in <u>any</u> fishery, with landings not limited to groundfish. These vessels are associated with total landings (Table 470) and total revenues (Table 471). Vessels active in the groundfish fishery, or those which landed at least one pound of groundfish in each of the given fishing years, are reported in Table 468. These vessels are associated with groundfish landings (Table 472) and groundfish revenues (Table 473). The problem with latent effort in the multispecies fishery is evident when the numbers of active vessels are compared to the numbers of permits alone. In the years 1996 through 2001, multispecies vessels active in any fishery, as a percent of total permitted vessels, ranged from 49.5% to 54.6%. The number of total active vessels (those which landed at least one pound of any species) generally trended downward from 1996 to 2000 and increased nearly 5% from 2000 to 2001.

Permit Category	1996	1997	1998	1999	2000	2001
Individual DAS	147	144	130	131	130	132
Fleet DAS	1,072	1,019	954	935	903	884
Small vessel exemption	7	8	6	7	7	4
Hook gear	93	114	108	112	96	99
Combination vessel	44	40	41	38	45	44
Large mesh, individual DAS	0	1	1	1	2	2
Large mesh, fleet DAS	9	14	17	17	24	58
Open Access Combined	537	643	652	702	704	784
Unknown Category	290	20	25	19	20	16
Total	**2,199**	**2,003**	**1,934**	**1,962**	**1,931**	**2,023**

Table 467 - Number of multispecies vessels active in any fishery by permit category, 1996-2001
Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Permitted multispecies vessels that were active in the groundfish fishery itself represent an even smaller fraction of the total permits (Table 468). As a percentage of the number of vessels which were active in *any* fishery, those active in the *groundfish* fishery ranged from 61.6% to 67.1% in 1996 through 2001. In 2001, there were nearly three times more permitted multispecies vessels than vessels which actually reported landings of groundfish. This number of active groundfish vessels (those which landed at least one pound of groundfish) decreased slightly from 1996 to 1999 and increased slightly in the following years, yet generally remained steady across the time period.

Among both the active total and the active groundfish vessels, the greatest percent decreases were exhibited in the Fleet DAS and Individual permit categories, with an average annual percent decline of about 7% in each category. For active groundfish vessels only, the greatest increases were in numbers of large mesh fleet (avg. annual increase of 47.8%) and open access vessels (avg. annual increase of 8.2%). It is important to note that vessels are allowed to change permit categories from year to year, and a decline in one category may result from movement of vessels into another category and not due to loss of active vessels from the groundfish fishery. This is particularly evident in the years 1999 through 2001, when the total number of multispecies vessels active in the groundfish fishery was increasing while the number of vessels in some permit categories decreased during this period. For example, it is likely that the Fleet DAS category, which diminished from 1996 to 2001, experienced a movement of Fleet vessels into the Large Mesh Fleet category, which expanded during that same time period.

Permit Category	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Individual DAS	143	140	129	130	129	131
Fleet DAS	829	814	767	740	745	730
Small Vessel Exemption	3	4	3	5	5	3
Hook Gear	70	75	83	84	76	78
Combination Vessel	36	34	34	35	38	32
Large Mesh, Individual DAS	0	1	1	1	2	2
Large Mesh, Fleet DAS	9	9	14	14	21	49
Open Access Combined	192	209	243	254	278	283
Unknown Category	72	3	5	2	2	6
Total	**1,354**	**1,289**	**1,279**	**1,265**	**1,296**	**1,314**

Table 468 - Number of multispecies vessels active in the groundfish fishery by permit category, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

<u>Permits in Other Fisheries</u>

As is evident in the discrepancies between number of vessels active in any fishery and those active in the groundfish fishery, multispecies permit holders are engaged in other regulated, non-groundfish fisheries. To determine which other fisheries multispecies permit holders participate in, the composition of total permits held by multispecies permit holders was determined. Only the years following implementation of Amendment 7 permit categories are included in these analyses (1996-2001). Some of the other species permits multispecies permit holders now possess were not in existence in some years prior to the present. For example, monkfish and dogfish permits were not required until fishing year 1999. Most of the other permits held by multispecies permit holders were in existence by 1999, with the exception of tilefish.

Because of the addition of new permit requirements for various regulated species, the average number of permits held by an individual multispecies permit holder has increased from 3.25 permits in 1994 to 7.32 permits in 2001. In 1994, 25.9% of multispecies permit holders had a single multispecies permit and no additional permits. This percentage dropped to 23.2% in 1996 and again to 9.7% in 2001. One to five additional permits (other regulated species permits or additional open access multispecies permits) were held by 67% of multispecies permit holders in 1994 and 70.4% in 1996, decreasing to 34.4% in 2001. Six to ten additional permits were held by 7% of multispecies permit holders in 1994 and 6.4% in 1996, rising in subsequent years to 39.4% in 2001. Eleven to fifteen additional permits were held by no multispecies permit holders in 1994 and 1996, and rose to 14.5% in 2001.

These data show that multispecies permit holders are likely to hold between one and ten additional permits, depending on permit requirements from year to year. Few multispecies permit holders will depend on a single multispecies permit, especially with the increasing need to obtain permits in order to stay active in other fisheries. However, even with the increasing availability of new species permits in fishing years following 1998, few multispecies permit holders will choose to *maximize* their number of permits, that is, obtain the most additional permits possible. This is evident in the very small percentage of permit holders obtaining more than ten additional permits and is possibly explained by the broad geographic range of the species for which there are permits available.

Out of the total number of permits they possessed, multispecies Category A (Individual DAS) vessels had the greatest proportion of non-multispecies permits of any of the permit categories. In 1996, 81% of the permits held by multispecies category A vessels were non-multispecies permits, increasing to 91% in 2001. Multispecies Category D (Hook gear) vessels tended to have the lowest proportion of non-multispecies permits of their total permits held. 59% of the permits held by multispecies category D vessels were non-multispecies permits in 1996, increasing to 82% in 2001. (Table 469)

Calculating the average number of permits per multispecies permit holder including *only* those permits which have been required since 1994 has, of course, different results. This number has ranged from 2.9 to 3.5 permits from 1994 to 2001, remaining very consistent across the time period. The specific types of permits owned by multispecies permit holders may have changed since Amendment 5, and permits have been redistributed among different fishery participants. However, despite effort reduction programs and stricter regulations in the groundfish and related fisheries, permit holders have not, on average, lost numbers of permits.

The variety of available permits has increased since 1996 and has had an effect on the composition of the permits held by multispecies permit holders. From 1996 to 1998, most of the non-multispecies permits possessed by groundfish vessels were squid/mackerel/butterfish permits, followed by scallop, lobster, fluke and surf clam permits. From 1999 to 2001, squid/mackerel/butterfish permits comprised the highest percentage of non-multispecies permits, followed by lobster, dogfish, monkfish and scallop permits. With the new requirements for dogfish and monkfish permits, scallop permits made up a smaller percentage of the total “other” permits held by multispecies vessels. Clearly, however, squid/mackerel/butterfish, lobster, and scallop fisheries have remained important fisheries for multispecies vessels which have sought diversification as a means of supplementing their income obtained from groundfish.

Multispecies Permit Category		Individual DAS (A)	Fleet DAS (B)	Small Vessel Exemption (C)	Hook Gear (D)	Combination Vessel (E)	Large Mesh Individual DAS (F)	Large Mesh Fleet DAS (G)	Open Access Combined (H, J, K)
1996	Other Permits	826	4473	26	202	229	3	33	2953
	Mult. Permits	191	1415	16	142	48	1	10	1445
	TOTAL	**1017**	**5888**	**42**	**344**	**277**	**4**	**43**	**4398**
	% Other Perms of Total	**81.2%**	**76.0%**	**61.9%**	**58.7%**	**82.7%**	**75.0%**	**76.7%**	**67.1%**
1997	Other Permits	1037	6135	58	474	309	8	84	5831
	Mult. Permits	178	1353	16	210	47	2	16	2027
	TOTAL	**1215**	**7488**	**74**	**684**	**356**	**10**	**100**	**7858**
	% Other Perms of Total	**85.3%**	**81.9%**	**78.4%**	**69.3%**	**86.8%**	**80.0%**	**84.0%**	**74.2%**
1998	Other Permits	767	5148	32	365	272	4	63	5722
	Mult. Permits	138	1259	12	199	44	1	18	2022
	TOTAL	**905**	**6407**	**44**	**564**	**316**	**5**	**81**	**7744**
	% Other Perms of Total	**84.8%**	**80.3%**	**72.7%**	**64.7%**	**86.1%**	**80.0%**	**77.8%**	**73.9%**
1999	Other Permits	1141	8147	63	711	376	4	117	9774
	Mult. Permits	138	1279	15	199	43	1	19	2276
	TOTAL	**1279**	**9426**	**78**	**910**	**419**	**5**	**136**	**12050**
	% Other Perms of Total	**89.2%**	**86.4%**	**80.8%**	**78.1%**	**89.7%**	**80.0%**	**86.0%**	**81.1%**
2000	Other Permits	1265	9440	60	798	426	16	227	13116
	Mult. Permits	141	1261	14	186	47	2	29	2566
	TOTAL	**1406**	**10701**	**74**	**984**	**473**	**18**	**256**	**15682**
	% Other Perms of Total	**90.0%**	**88.2%**	**81.1%**	**81.1%**	**90.1%**	**88.9%**	**88.7%**	**83.6%**
2001	Other Permits	1397	10075	46	867	481	29	531	15137
	Mult. Permits	143	1231	11	186	48	3	63	2777
	TOTAL	**1540**	**11306**	**57**	**1053**	**529**	**32**	**594**	**17914**
	% Other Perms of Total	**90.7%**	**89.1%**	**80.7%**	**82.3%**	**90.9%**	**90.6%**	**89.4%**	**84.5%**

Table 469 – Summary of Permit Distribution Among Multispecies Permit Holders

Landings and Revenues by Permit Category

From 1996 to 2001, the highest total landings were brought in by Fleet DAS and Open Access vessels (Table 470). Fleet DAS and Individual DAS vessels also landed a substantially greater percentage of groundfish landings than vessels in other categories, averaging 95% of the total in each year from 1996 to 2001 (Table 472). However, this proportion of groundfish landings attributed to vessels in Fleet DAS and Individual DAS categories decreased from 96.8% in 1996 to 92.3% in 2001. Other categories increased their contribution to groundfish landings during these years, including Large mesh Fleet DAS vessels which expanded their groundfish landings from 37,000 pounds in 1996 to 2,272,000 pounds in 2001. Open Access, Combination, and Hook Gear vessels also substantially increased their groundfish landings over the six years. As discussed previously, these changes primarily represent shifts in participation among different permit categories rather than extensive movement in and out of the fishery entirely. Vessels in the Small Vessel Exemption category contributed least to groundfish landings in all years. To maintain confidentiality, landings associated with the small number of Large Mesh Individual DAS vessels were not reported. The landings in Table 472 are associated with the number of vessels in Table 468.

Total revenue trends were similar to those for total landings across permit categories (Table 471). Across all years, Individual DAS vessels were more financially dependent on groundfish than vessels in other permit categories (Table 473). Groundfish revenues accounted for, on average, 69% of total revenues in this permit category. Fleet DAS and Hook Gear vessels ranked second in dependence on groundfish—for each, groundfish revenues averaged 30% of total revenues.

Permit Category	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Individual DAS	66,710	58,315	56,199	51,206	56,432	67,218
Fleet DAS	273,218	307,318	273,248	233,946	228,439	229,936
Small vessel exemption	14	30	21	15	37	11
Hook gear	3,611	3,626	5,113	4,354	7,278	2,932
Combination vessel	16,212	27,741	26,118	17,349	11,247	12,839
Large mesh, individual DAS	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report
Large mesh, fleet DAS	678	2,015	3,233	2,202	3,206	8,168
Open Access Combined	75,481	128,853	157,901	158,572	179,002	228,601
Unknown Category	17,616	318	496	286	25	65
Total	**453,540**	**528,216**	**522,329**	**467,929**	**485,665**	**549,770**

Table 470 - Total landings by multispecies vessels by permit category, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Landings in thousands of pounds.***

Permit Category	1996	1997	1998	1999	2000	2001
Individual DAS	$62,066	$58,364	$58,035	$64,710	$63,541	$63,285
Fleet DAS	$141,636	$144,590	$134,597	$142,158	$133,165	$122,002
Small vessel exemption	$31	$39	$28	$32	$46	$14
Hook gear	$3,429	$4,120	$4,469	$4,422	$3,476	$3,075
Combination vessel	$20,172	$18,676	$17,700	$25,701	$32,644	$27,967
Large mesh, individual DAS	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report
Large mesh, fleet DAS	$615	$1,654	$2,532	$3,048	$4,383	$9,387
Open Access Combined	$95,171	$100,113	$101,008	$142,534	$168,061	$162,605
Unknown Category	$16,368	$126	$347	$111	$42	$52
Total	**$339,489**	**$327,682**	**$318,715**	**$382,716**	**$405,359**	**$388,388**

Table 471 - Total revenues by multispecies vessels by permit category, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Permit Category	1996	1997	1998	1999	2000	2001
Individual DAS	33,856	35,450	33,209	34,618	40,498	50,426
Fleet DAS	36,223	33,813	34,306	33,110	44,309	45,328
Small vessel exemption	1	1	6	6	23	1
Hook gear	703	1,015	987	810	897	1,093
Combination vessel	1,082	1,113	1,965	1,920	2,966	3,682
Large mesh, individual DAS	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report
Large mesh, fleet DAS	37	499	553	558	721	2,272
Open Access Combined	248	842	574	481	869	909
Unknown Category	235	0	47	12	5	7
Total	**72,384**	**72,734**	**71,647**	**71,515**	**90,287**	**103,718**

Table 472 - Groundfish landings by multispecies vessels by permit category, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Landings in thousands of pounds.***

Permit Category	1996	1997	1998	1999	2000	2001
Individual DAS	$40,185	$40,549	$41,272	$43,541	$43,360	$47,575
Fleet DAS	$39,577	$37,535	$40,904	$39,138	$45,414	$43,448
Small vessel exemption	$1	$1	$8	$8	$26	$1
Hook gear	$821	$1,228	$1,333	$1,105	$1,195	$1,259
Combination vessel	$1,321	$1,367	$2,628	$2,542	$3,269	$3,661
Large mesh, individual DAS	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report	Cannot Report
Large mesh, fleet DAS	$42	$549	$696	$683	$783	$2,365
Open Access Combined	$225	$1,016	$724	$580	$842	$946
Unknown Category	$272	$1	$48	$15	$4	$9
Total	**$82,444**	**$82,244**	**$87,612**	**$87,612**	**$94,894**	**$99,263**

Table 473 - Groundfish revenues by multispecies vessels by permit category, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

DAS Use by Permit Category

According to the NMFS Enforcement call-in database, the percent of total DAS allocated to all permit holders that was used by vessels that reported activity via the call-in system, increased annually from 22% in 1996 to 42% in 2001. Permitted vessels that called in used between 37% (1996) and 59% (2001) of their allocated DAS, an average annual increase of 4.4%. The Individual DAS permit category used the greatest percentage of their allocated category DAS in each year from 1996 to 2001. In the last three fishing years (1999-2001), this permit category used more than 90% of their allocated DAS. Although the Fleet DAS permit category accounted for the greatest use of total allocated DAS to vessels that used the call-in system (55% to 65% of total allocated DAS from 1996 to 2001), they used only 28% to 53% of their allocated category DAS. Hook gear permit holders used the smallest percentage of their allocated category DAS, increasing from 7% in 1996 to 26% in 2001 but maintaining the lowest fraction of allocated DAS used by any permit category each year. Table 474 provides additional information about the distribution of DAS activity by permit category.

Permit Categories		Total Number of Permitted Vessels with Allocated DAS (1)	Total Days-at-Sea Allocated (2)	Number of Permitted Vessels that Called In (3)	DAS Allocated to Vessels that Called In (4)	Total DAS Used by Vessels that Called In (5)	% of total allocated DAS Used by Vessels that called in ((5)/(2)*100)	% of allocated DAS (to vessels that called in) Used by Vessels that Called In ((5)/(4)*100)
1996	Individual	175	27,607	155	25,392	21,889	79	86
	Fleet	1,349	187,511	744	103,416	28,590	15	28
	Combination	47	2,501	14	1,021	660	26	65
	Hook Gear	127	17,514	72	10,008	733	4	7
	Large Mesh	7	1,085	5	775	95	9	12
	Total	**1,705**	**236,218**	**990**	**140,612**	**51,968**	**22**	**37**
1997	Individual	173	21,455	149	19,028	15,980	74	84
	Fleet	1,285	112,893	809	71,093	30,758	27	43
	Combination	43	1,874	15	1,136	596	32	52
	Hook Gear	197	17,248	106	9,328	1,545	9	17
	Large Mesh	15	1,800	11	1,320	585	33	44
	Total	**1,713**	**155,270**	**1,090**	**101,905**	**49,464**	**32**	**49**
1998	Individual	137	17,984	130	17,079	15,269	85	89
	Fleet	1,225	114,911	787	75,476	33,948	30	45
	Combination	44	2,083	22	1,573	1,071	51	68
	Hook Gear	212	19,716	109	10,482	1,910	10	18
	Large Mesh	18	2,295	14	1,805	738	32	41
	Total	**1,636**	**156,989**	**1,062**	**106,415**	**52,935**	**34**	**50**
1999	Individual	134	17,538	129	17,079	15,607	89	91
	Fleet	1,255	119,386	799	75,953	34,937	29	46
	Combination	42	2,229	23	1,692	966	43	57
	Hook Gear	195	18,825	98	9,568	1,831	10	19
	Large Mesh	20	2,474	18	2,214	930	38	42
	Total	**1,646**	**160,452**	**1,067**	**106,506**	**54,271**	**34**	**51**
2000	Individual	140	18,265	134	17,697	16,017	88	91
	Fleet	1,247	118,216	800	77,254	40,191	34	52
	Combination	47	2,451	23	1,749	1,146	47	66
	Hook Gear	185	17,930	98	9,590	1,923	11	20
	Large Mesh	30	3,857	27	3,467	2,012	52	58
	Total	**1,649**	**160,720**	**1,082**	**109,757**	**61,290**	**38**	**56**
2001	Individual	137	17,819	131	17,279	16,276	91	94
	Fleet	1,173	112,313	794	76,856	41,095	37	53
	Combination	47	2,348	23	1,681	1,102	47	66
	Hook Gear	173	16,558	94	9,016	2,309	14	26
	Large Mesh	58	7,251	54	6,740	4,493	62	67
	Total	**1,588**	**156,290**	**1,096**	**111,572**	**65,275**	**42**	**59**
2002*	Individual	138	13,884	131	13,624	12,329	89	90
	Fleet	1,036	47,977	732	40,897	24,695	51	60
	Combination	46	1,637	16	962	663	40	69
	Hook Gear	120	3,607	61	2,389	875	24	37
	Large Mesh	57	4,113	51	3,938	2,849	69	72
	Total	**1,397**	**71,218**	991	61,812	41,410	58	67

Table 474 - Days-at-Sea usage by limited access permit category, 1996-2002

This table includes data from multispecies/monkfish DAS trips (in which the multispecies and monkfish clocks run concurrently). DAS totals include any adjusted gillnet DAS totals. Cells with shading are not comparable to previous years. Data Source: NMFS Enforcement DAS Call-In Database

Summary

The total number of multispecies permits declined from 1996 to 1998 but increased in later years, returning to nearly its 1996 level by 2001. Since 1996, open access permits have made up the greatest proportion of total multispecies permits. The open access permit category is expanding, having increased an average of nearly 10% each year from 1996 to 2001. Fleet DAS vessels make up the greatest proportion of limited access vessels, followed by Hook Gear vessels and Individual DAS vessels. In general, while numbers of individual, fleet and small vessel exemption permits declined from 1996 to 2001, numbers of hook gear, large mesh fleet and open access permits increased. Combination vessel and large mesh individual permits remained relatively constant across the time period.

The number of multispecies vessels active in the groundfish fishery as a percentage of total active multispecies vessels indicates that a substantial amount of latent effort exists in the fishery. In 2001, there were nearly three times more multispecies permits than vessels which actually reported landings of groundfish. The number of active groundfish vessels has generally remained steady from 1996 to 2001. There have also been changes in distribution among permit categories, probably the most movement occurring between fleet DAS and large mesh fleet DAS vessels.

An investigation of the non-multispecies permits held by multispecies permit holders demonstrates that squid/mackerel/butterfish, lobster and scallop fisheries have been important fisheries to multispecies vessels which have sought diversification as a means of supplementing their income obtained from groundfish since 1994.

From 1996 to 2001, the highest total landings were brought in by Fleet DAS and Open Access vessels. Fleet DAS and Individual DAS vessels also landed a substantially greater percentage of groundfish landings than vessels in other categories in this time period. Vessels in the Small Vessel Exemption category contributed least to groundfish landings in all years. Many changes in distribution of landings among permit categories represent shifts in participation across categories rather than extensive movement in and out of the fishery entirely.

Total revenues trends did not closely mimic total landings trends across all years due to changes in species composition of total landings and the differing market values of those species. Groundfish revenues decreased between 1994 and 1996 then generally trended upwards between 1996 and 2001. Across all years, Individual DAS vessels were more financially dependent on groundfish than vessels in other permit categories. This is also reflected in day-at-sea use by Individual DAS vessels, which used the greatest percentage of their allocated category DAS in each year from 1996 to 2001.

9.4.2.4.2 Fishing Activity by Vessel Length Class

Data on fishing activity were compiled by length classes. Based on the recommendations of the NEFMC Groundfish Oversight Committee, four distinct ranges were identified as separate vessel length classes.

Length Class 1: Vessels less than 30 feet in length
Length Class 2: Vessels 30 feet to less than 50 feet in length
Length Class 3: Vessels 50 feet to less than 75 feet in length
Length Class 4: Vessels greater than or equal to 75 feet in length

Data Caveats

The vessel length data were gathered from the vessels' permit applications for each fishing year and compiled on a trip-by-trip basis.

The total number of vessels by length class was generated from the NMFS permit database and includes all active and inactive permitted multispecies vessels with reported lengths. Data are reported since 1994.

Number of Vessels by Length Class

Vessels from 30 to 50 feet have consistently made up the greatest proportion of multispecies vessels from 1994 to 2001. Vessels less than 30 feet make up the second largest length class, with just under half the number of 30 to 50 foot vessels. The largest vessels make up the smallest percentage of the total. (Table 475)

In general, the number of smallest vessels has diminished most substantially, demonstrating the greatest percent declines of all length classes from 1994 to 2001, particularly in the periods directly following Amendments 5 and 7. From 1994 to 1996, vessels less than 30 feet in length showed the greatest percent decline in numbers (23.7% decrease from 1994 to 1996), followed by vessels 50 to less than 75 feet (3.9% decrease) and vessels 30 to less than 50 feet (7% decrease), with very little change in vessels 75 feet or greater.

Across all length classes the greatest declines occurred from 1996 to 1998. Again, in this 2-year period the smallest vessels (less than 30 feet) experienced the greatest losses, the number dropping 20.8%. The number of vessels in the 30 to less than 75 foot range decreased about 17% in these years. The number of large vessels (75 feet and greater) decreased 14.4%. Since 1998, the number of vessels in each length class has increased or remained relatively constant, with the greatest annual increase among vessels under 30 feet, averaging about 10% per year.

Vessel Length Class	1994	1995	1996	1997	1998	1999	2000	2001
Less than 30 feet	1162	1074	887	788	702	745	810	933
30 feet to less than 50 feet	2289	2381	2200	1891	1823	1934	2046	2081
50 feet to less than 75 feet	825	823	767	708	636	651	646	646
75 feet or greater	446	456	444	415	380	384	399	406
Total	**4,722**	**4,734**	**4,298**	**3,802**	**3,541**	**3,714**	**3,901**	**4,066**

Table 475 - Total number of multispecies vessels by length class, 1994-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Landings and Revenues by Vessel Length Class

Vessels less than 30 feet in length demonstrated the greatest annual percent increases in total landings in each year from 1994 to 1996 (Table 476). However, revenues for these vessels declined during that same time period, from $2,279,000 dollars in 1994 to $1,498,000 dollars in 2001 (Table 477). From 1996 to 1997, the largest vessels (75 feet and greater) demonstrated a greater percent increase in total landings than smaller vessels (under 75 feet). Revenues for vessels greater than 30 feet in length generally trended upwards across the time period, with some variability. The largest vessels experienced a constant slight decline in total revenues from 1994 to 1998, with a 23.5% increase from 1998 to 1999 and a 11.2% increase from 1999 to 2000. All length classes experienced declines in revenues through 1998, with the smallest vessels (under 30 feet) demonstrating the greatest percent loss per year.

Groundfish landings generally increased across all length classes between 1994 and 2001 (Table 478). Vessels 75 feet and greater were responsible for the highest total landings in every year from 1994 to 2001, followed by vessels 50-75 feet, 30-50 feet and under 30 feet. However, vessels 50 to less than 75 feet contributed to the highest groundfish landings, with vessels 75 feet and greater following closely.

Landings of vessels 50 to less than 75 feet were 28,892,000 pounds in 1994, fluctuated slightly between 1994 and 1997, and steadily increased after 1997, reaching 43,645,000 pounds in 2001. Vessels 75 feet and greater landed 26,249,000 pounds in 1994 with landings dropping about 3 million pounds in 1995 and increasing to 35,194,000 pounds in 2001. Groundfish landings by vessels 30 to less than 50 feet fluctuated between 17,800,000 pounds and 19,483,000 pounds from 1994 to 1998. Landings in this length class decreased about 8.5% from 1998 to 1999 and increased 48.7% from 1999 to 2001. The smallest vessels, while contributing the least groundfish landings in all years from 1994 to 2001, demonstrated the greatest average annual percent increases from year to year during this time period, particularly after 1999. The groundfish landings by vessels less than 30 feet in length increased 27.2% from 491,000 pounds in 1999 to 625,000 pounds in 2000, and from that point increased an additional 33.9% to 836,000 pounds in 2001.

Groundfish revenues decreased between 2% and 9% in all length classes from 1994 to 1996. Groundfish revenue trends were generally positive across all length classes from 1996 to 2001(Table 479). Although revenues generated by vessels less than 30 feet comprised only 1% of total groundfish revenues per year from 1994 to 2001, revenues in this length class demonstrated the greatest percent increases over the time period.

Vessel Length Class	1994	1995	1996	1997	1998	1999	2000	2001
Less than 30 feet	1,215	1,545	2,008	1,632	1,307	1,273	1,899	1,574
30 feet to less than 50 feet	67,685	79,454	73,826	67,836	66,529	59,470	55,828	54,959
50 feet to less than 75 feet	127,918	138,312	141,872	161,520	134,022	134,653	142,791	152,814
75 feet or greater	221,253	219,185	235,835	297,800	320,824	272,535	285,784	341,216
Total	**418,071**	**438,497**	**453,540**	**528,788**	**522,683**	**467,931**	**486,302**	**550,562**

Table 476 - Total landings by multispecies vessels by length class, 1994-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Vessel Length Class	1994	1995	1996	1997	1998	1999	2000	2001
Less than 30 feet	$2,279	$3,080	$2,276	$1,931	$1,823	$2,005	$1,542	$1,498
30 feet to less than 50 feet	$59,364	$63,978	$55,816	$53,883	$53,789	$61,621	$58,014	$59,303
50 feet to less than 75 feet	$117,354	$110,010	$111,182	$109,945	$104,324	$122,709	$128,030	$123,429
75 feet or greater	$182,481	$171,561	$170,215	$162,079	$158,934	$196,383	$218,410	$204,889
Total	**$361,479**	**$348,628**	**$339,489**	**$327,839**	**$318,870**	**$382,718**	**$405,996**	**$389,118**

Table 477 - Total revenues by multispecies vessels by length class, 1994-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Vessel Length Class	1994	1995	1996	1997	1998	1999	2000	2001
Less than 30 feet	490	540	521	601	644	491	625	836
30 feet to less than 50 feet	19,483	17,800	18,014	19,007	18,115	16,572	21,538	24,650
50 feet to less than 75 feet	28,892	26,345	30,384	29,430	29,718	30,443	37,942	43,645
75 feet or greater	26,469	23,094	23,466	23,697	23,171	24,011	30,670	35,194
Total	**75,334**	**67,779**	**72,384**	**72,734**	**71,649**	**71,517**	**90,775**	**104,325**

Table 478 - Groundfish landings by multispecies vessels by length class, 1994-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Vessel Length Class	1994	1995	1996	1997	1998	1999	2000	2001
Less than 30 feet	$679	$663	$557	$682	$884	$689	$789	$941
30 feet to less than 50 feet	$23,518	$20,801	$18,593	$20,659	$21,311	$19,733	$22,673	$24,154
50 feet to less than 75 feet	$36,681	$34,042	$35,512	$33,855	$36,176	$36,645	$38,787	$40,563
75 feet or greater	$33,146	$29,997	$27,781	$27,048	$29,244	$30,547	$33,057	$34,082
Total	**$94,025**	**$85,503**	**$82,444**	**$82,244**	**$87,614**	**$87,615**	**$95,306**	**$99,740**

Table 479 - Groundfish revenues by multispecies vessels by length class, 1994-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

DAS Use by Length Class

The total number of vessels using DAS increased just 3% from 1998 to 2000 (Table 480). Since 2000, the total number of permitted limited access vessels has declined. The number of DAS used by all length classes has increased since 1997. Generally, larger vessels use a higher percentage of their allocated DAS. Since 1996, active limited access vessels in all length classes have been using a greater percentage of their allocated DAS. Vessels less than 50 feet in length used 49% of their allocated DAS, while vessels 50 feet and greater used 71% of their allocated DAS. Vessels up to 29 feet experienced the largest recent increase in DAS use (37%) between fishing years 2000 and 2001, although vessels in the 30-49 foot length class used the greatest raw number of DAS in 2001.

Permit Categories		Total Number of Permitted Vessels with Allocated DAS (1)	Total Days-at-Sea Allocated (2)	Number of Permitted Vessels that Called In (3)	DAS Allocated to Vessels that Called In (4)	Total DAS Used by Vessels that Called In (5)	% of total allocated DAS Used by Vessels that called in ((5)/(2)*100)	% of allocated DAS (to vessels that called in) Used by Vessels that Called In ((5)/(4)*100)
1995	1 - 29 feet	1	190	0	0	0	0	-
	30 - 49 feet	95	17,875	45	8,612	2,122	12	25
	50 - 74 feet	441	82,058	279	52,337	20,956	26	40
	75+ feet	213	37,321	114	22,366	15,426	41	69
	unknown	19	3,512	2	380	24	1	6
	Total	**769**	**140,956**	**440**	**83,695**	**38,527**	**27**	**46**
1996	1 - 29 feet	103	14,317	50	6,950	619	4	9
	30 - 49 feet	897	124,794	477	66,546	12,887	10	19
	50 - 74 feet	488	67,352	339	48,090	24,218	36	50
	75+ feet	216	29,616	123	18,887	14,238	48	75
	unknown	1	139	1	139	5	4	4
	Total	**1,705**	**236,218**	**990**	**140,612**	**51,968**	**22**	**37**
1997	1 - 29 feet	116	10,240	65	5,720	843	8	15
	30 - 49 feet	910	80,779	557	49,727	19,181	24	39
	50 - 74 feet	469	43,138	343	32,708	19,543	45	60
	75+ feet	206	20,145	123	13,574	9,849	49	73
	unknown	12	968	2	176	49	5	28
	Total	**1,713**	**155,270**	**1,090**	**101,905**	**49,464**	**32**	**49**
1998	1 - 29 feet	115	10,770	67	6,446	1,109	10	17
	30 - 49 feet	909	86,291	551	53,876	21,078	24	39
	50 - 74 feet	425	41,428	324	32,896	20,794	50	63
	75+ feet	175	17,350	119	13,099	9,903	57	76
	unknown	12	1,150	1	98	51	4	52
	Total	**1,636**	**156,989**	**1,062**	**106,415**	**52,935**	**34**	**50**
1999	1 - 29 feet	118	11,224	61	5,948	1,006	9	17
	30 - 49 feet	921	88,702	548	52,840	21,330	24	40
	50 - 74 feet	434	42,834	331	33,647	21,543	50	64
	75+ feet	172	17,673	127	14,071	10,393	59	74
	unknown	1	20	0	0	0	0	-
	Total	**1,646**	**160,452**	**1,067**	**106,506**	**54,271**	**34**	**51**
2000	1 - 29 feet	123	11,266	61	5,860	1,073	10	18
	30 - 49 feet	919	89,397	562	55,721	26,444	30	47
	50 - 74 feet	430	42,264	331	33,870	22,953	54	68
	75+ feet	174	17,616	128	14,306	10,820	61	76
	unknown	3	177	0	0	0	0	-
	Total	**1,649**	**160,720**	**1,082**	**109,757**	**61,290**	**38**	**56**
2001	1 - 29 feet	122	11,293	66	6,404	1,474	13	23
	30 - 49 feet	888	87,042	587	58,348	30,299	35	52
	50 - 74 feet	407	40,666	321	33,250	23,139	57	70
	75+ feet	170	17,212	122	13,571	10,364	60	76
	unknown	1	77	0	0	0	0	-
	Total	**1,588**	**156,290**	**1,096**	**111,572**	**65,275**	**42**	**59**
2002*	1 - 29 feet	91	2,518	43	1,497	526	21	35
	30 - 49 feet	750	33,731	524	28,540	16,736	50	59
	50 - 74 feet	391	24,068	303	21,910	15,956	66	73
	75+ feet	165	10,901	121	9,864	8,192	75	83
	unknown	0	0	0	0	0	-	-
	Total	**1,397**	**71,218**	**991**	**61,812**	**41,410**	**58**	**67**

Table 480 - Days-at-Sea usage by vessel length class, 1995-2002

This table includes data from multispecies/monkfish DAS trips (in which the multispecies and monkfish clocks run concurrently). DAS totals include any adjusted gillnet DAS totals. Cells with shading are not comparable to previous years. Data Source: NMFS Enforcement DAS Call-In Database, NMFS Permit Database

Summary

The multispecies fleet is composed primarily of small to medium-sized vessels. Vessels from 30 to 50 feet have consistently made up the greatest proportion of multispecies vessels from 1994 to 2001. In general, the number of smallest vessels has diminished most substantially, demonstrating the greatest percent declines of all length classes from 1994 to 2001, particularly in the periods directly following Amendments 5 and 7. Across all length classes the greatest declines occurred from 1996 to 1998, with vessels under 30 feet experiencing the greatest losses. Since 1998, the number of vessels in each length class has increased or remained relatively constant, with the greatest annual increase among vessels under 30 feet.

The smallest vessels demonstrated the greatest annual percent increases in total landings in each year from 1994 to 1996. However, revenues for these vessels declined during that same time period. From 1996 to 1997, the largest vessels demonstrated a greater percent increase in total landings than smaller vessels. All length classes experienced declines in total revenues through 1998, with the smallest vessels (under 30 feet) demonstrating the greatest percent loss per year.

Groundfish landings generally increased across all length classes between 1994 and 2001. The largest vessels, while making up the smallest percentage of total vessels, were responsible for the highest total landings in every year from 1994 to 2001. However, vessels 50 to less than 75 feet contributed to the highest *groundfish* landings, with vessels 75 feet and greater following closely. Groundfish landings by mid-sized vessels fluctuated between 1994 and 1998. The smallest vessels, while contributing the least groundfish landings in all years from 1994 to 2001, demonstrated the greatest average annual percent increases from year to year during this time period, particularly after 1999. Groundfish revenues decreased slightly in all length classes from 1994 to 1996. Groundfish revenue trends were generally positive across all length classes from 1996 to 2001.

9.4.2.4.3 Fishing Activity by Gear Type

Many different gear types are used to harvest the resource in the multispecies fishery. These gears are described in detail under "Gear Descriptions" (Section 9.3.1.2.2 of the Amendment 13 EFH DEIS). The four primary gear types in the multispecies fishery, as determined from the monetary value of landings associated with that type of gear, are the **bottom trawl**, **bottom longline**, **hook and line** and **sink gillnet**.

Vessel owners are required to report their primary gear type on their multispecies permit application. On each Vessel Trip Report, the permit holder is instructed to list the actual gear used to harvest the landed catch on that trip. The gear actually used to catch the fish landed may or may not coincide with the primary gear designation on the vessel's permit application.

Data Caveats

Primary Gear Types and Landings by Gear

For fishing activity reported by permit category, vessel length class, and home port state, reported number of vessels are associated with reported landings and revenues. This is not true for fishing activity by gear type. All NMFS permit records of vessels associated with a primary gear type as indicated on their permit application were merged with NMFS dealer records on a trip-by-trip basis to eliminate records of vessels without multispecies permits and those records of gears not associated with a particular trip (i.e., total landings greater than zero). It is important to note that the total number of vessels by primary gear type in Table 481 is not directly associated with the landings reported in Table 482 and Table 484. In other words, 85,422,000 pounds of groundfish were caught and landed by vessels using bottom trawls, but those vessels did not necessarily indicate bottom trawls as the primary gear type on their permit. **Total**

and groundfish landings in this section are reported by the gear type physically used to harvest the fish landed. In some cases, the gear used to harvest the catch on a specific trip was not equivalent to the gear reported by the vessel owner as the primary gear type. **The total number of *vessels* was determined based on the primary gear type indicated on each permit** in order to avoid double-counting of vessels for which more than one gear type is associated with real landings of fish in any given fishing year.

Day and trip gillnet totals were queried from the NMFS Enforcement database. Because some vessels may not have reported whether they were day or trip gillnetters, the sink gillnet total is, in all cases, higher than the sum of day and trip gillnets. Additionally, the day and trip gillnet categories were not introduced until 1997 and therefore, cannot be distinguished in 1995 and 1996. For all gear types, records from 1994 were excluded from Table 481 because of concerns about the accuracy of the data.

"All other" gears represent permits that did not report a primary gear type or permits indicating actual gear types that do not fall into any of the specific categories listed. For landings and revenues, the values associated with the "other" gear category may also represent aggregate records reported by dealers that include multiple trips of one or more vessels.

Number of Vessels by Primary Gear Type

Bottom trawls were the top gear indicated as primary gear type from 1995 to 2001, making up 33-36% of the total number of vessels in those years. From 1996 to 1997, the number of vessels with bottom trawls as primary gear types decreased about 7% and remained fairly steady after 1997. Hook and line vessels represented 15-20% of the total in each year from 1995 to 2001 and sink gillnets 11-17% of the total in this same period. From 1997 to 2001, the number of vessels using primarily day gillnets was 2.5 to 3 times that using trip gillnets. Midwater trawls were indicated in very small numbers. (Landings reflect that while the use of midwater trawls contributed significantly to total landings, groundfish landings associated with this gear are negligible.) The relative proportions of each gear type remained fairly consistent during the period, with the exception of shrimp trawls which decreased substantially as a percentage of the total, falling an average of 14.5% per year. (Table 481)

Gear Type	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Bottom Trawl*	749	742	691	689	666	691	717
Bottom Longline*	82	67	73	87	68	76	61
Hook and Line*	449	447	402	376	382	295	381
Sink Gillnet, total*	260	232	224	347	243	251	252
Day Gillnet	N/A	N/A	113	105	90	101	124
Trip Gillnet	N/A	N/A	32	29	37	41	49
Midwater Trawl	3	11	7	9	7	9	14
Shrimp Trawl	125	144	114	61	87	65	31
Scallop Dredge	198	213	195	184	195	221	283
Lobster Trap	153	159	126	127	146	146	136
All other	231	175	166	153	191	163	134
Total	**2250**	**2190**	**1998**	**2033**	**1985**	**1917**	**2009**

Table 481 - Total number of multispecies vessels by primary gear type, 1995 to 2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Landings and Revenues by Gear Used

Between 1994 and 2001, bottom trawls accounted for an average of 45.5% of the total landings in each year (Table 482). Following bottom trawls, the next four top contributors to total landings were "other" gears (which, as discussed above, likely include aggregate records), sink gillnets, scallop dredges, and midwater trawls. The relative ranks of these gears differed slightly from year to year. From 1994 to 2001, midwater trawl landings increased, on average, 43% from each year to the next, while landings by scallop dredges increased an average of 16.7% annually. The rise in midwater trawl landings may have resulted from the initiation of a herring permit in 1997 which required herring vessels to report landings, many of which did not do so prior to the permit requirement. Shrimp trawl landings declined, with an average drop of 16.6% each year. Total bottom trawl landings decreased from 1994 to 1996, increased from 1996 to 1998, and decreased at a relatively constant low rate from 1998 to 2001. Total sink gillnet landings fluctuated during the time period, decreasing overall from 1994 to 2001. This decline is primarily the result of restrictions in the dogfish and monkfish fisheries. Hook and line landings generally trended upward, doubling from 1994 to 2001. Bottom longline landings decreased slightly over the period. Total revenues trends mirrored changes in total landings (Table 483). Total revenues increased substantially for midwater trawls, although these revenues are only attributed to a *minute* quantity of groundfish landings. Although some multispecies permit holders indicated midwater trawls as their primary gear type, this gear is primarily used to harvest non-groundfish species, including herring.

Gear Type	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Bottom trawl*	237,964	228,269	214,830	227,433	242,471	206,073	201,259	198,586
Bottom longline*	8,965	8,905	7,869	8,970	8,559	6,921	7,083	7,105
Hook and line*	979	1,404	1,461	2,200	2,018	1,614	1,861	2,032
Sink gillnet, total*	41,991	53,056	49,983	43,990	46,003	37,854	30,462	35,165
Day Gillnet	N/A	N/A	N/A	24,417	25,906	17,903	13,081	18,391
Trip Gillnet	N/A	N/A	N/A	7,303	5,529	6,168	6,941	8,685
Midwater trawl	23,801	26,303	69,968	97,707	130,570	106,402	128,995	191,789
Shrimp trawl	12,438	15,888	15,440	9,491	3,893	6,210	3,665	1,384
Scallop dredge	16,671	15,482	16,460	14,185	13,993	21,482	30,557	41,879
Lobster trap	5,532	6,065	6,449	6,229	5,905	7,290	5,391	4,433
All other	69,730	83,125	71,079	118,584	69,271	74,085	77,029	68,189
Total	**418,071**	**438,497**	**453,540**	**528,788**	**522,683**	**467,931**	**486,302**	**550,562**

Table 482 - Total landings by multispecies vessels by gear used, 1994-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Gear Type	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Bottom trawl*	$176,972	$168,294	$159,429	$165,551	$167,224	$175,251	$172,571	$162,534
Bottom longline*	$10,929	$9,050	$7,403	$8,657	$9,201	$6,700	$5,893	$6,583
Hook and line*	$9,082	$10,228	$7,083	$5,848	$5,059	$5,534	$2,605	$2,467
Sink gillnet, total*	$26,234	$28,718	$25,881	$23,812	$26,016	$33,820	$30,293	$34,363
Day Gillnet	N/A	N/A	N/A	$12,429	$12,632	$14,146	$13,536	$18,561
Trip Gillnet	N/A	N/A	N/A	$5,175	$4,736	$6,814	$7,041	$8,451
Midwater trawl	$2,547	$4,120	$4,192	$5,488	$7,354	$6,619	$7,496	$11,874
Shrimp trawl	$11,839	$12,352	$12,069	$10,795	$5,110	$9,063	$7,499	$2,999
Scallop dredge	$74,222	$70,375	$83,342	$71,085	$65,194	$105,746	$141,604	$141,651
Lobster trap	$15,662	$16,309	$17,220	$16,223	$16,004	$21,747	$15,340	$11,717
All other	$33,992	$29,182	$22,869	$20,380	$17,710	$18,239	$22,696	$14,930
Total	**$361,479**	**$348,628**	**$339,489**	**$327,839**	**$318,870**	**$382,718**	**$405,996**	**$389,118**

Table 483 - Total revenues by multispecies vessels by gear used, 1994-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Groundfish landings by gear type exhibited slightly different trends (Table 484). Bottom trawls again accounted for the overwhelming bulk of landings in each year from 1994 to 2001. The proportion of bottom trawl groundfish landings increased every year from 72% in 1994 to 82% in 2001. Bottom trawl groundfish landings increased an average of 7.4% from year to year. Sink gillnets landed the second highest percentage of groundfish during these years, its percent contribution decreasing from 20.1% in 1994 to 13.2% in 2001. Gillnet landings declined throughout the late '90s, and increased 8.8% from 12,653,000 pounds in 2000 to 13,769,000 pounds in 2001, a level comparable to that in 1995. While day gillnet landings have remained higher than trip gillnet landings from 1995 to 2001, trip gillnets have increased their percent contribution to total gillnet landings. In 1997, day gillnet landings were almost twice that of trip gillnets and in 2001, day landings were only 1.3 times greater than trip landings. Bottom longlines, which ranked third in contribution to total groundfish landings, exhibited the greatest percent decline in landings of any of the gears, decreasing an average of 5.6% annually. Bottom longline groundfish landings dropped from 5,337,000 pounds in 1994 to 2,870,000 pounds in 1996 and fluctuated throughout the late '90s, falling again to 2,767,000 pounds in 2001. Hook and line vessels demonstrated the most dramatic increase in landings, with groundfish landings fourteen times higher in 2001 than in 1994. Midwater trawl landings fell below 1,000 pounds in all years except 1999, making a negligible contribution to total groundfish landings. Revenue trends generally mimicked landings trends from 1994 to 2001 (Table 485). Sink gillnet revenues exhibited the greatest percent declines, their revenue in 2001 28.6% lower than that in 1994. Revenues for this gear type experienced the steepest drop from 1994 to 1995 (14%). Despite a 8.8% increase in groundfish landings by sink gillnets from 2000 to 2001, revenues only increased 0.2% in that period.

Gear Type	1994	1995	1996	1997	1998	1999	2000	2001
Bottom trawl*	54,237	48,837	54,518	54,232	55,224	56,048	73,622	85,422
Bottom longline*	5,337	4,120	2,870	3,912	4,068	2,706	2,192	2,767
Hook and line*	121	603	711	893	1,079	793	1,420	1,663
Sink gillnet, total*	15,172	13,643	13,829	13,280	10,962	11,555	12,653	13,769
Day Gillnet	N/A	N/A	N/A	7,278	4,783	5,122	5,123	6,884
Trip Gillnet	N/A	N/A	N/A	3,768	3,714	3,694	4,984	5,171
Midwater trawl	0	0	0	0	0	1	0	0
Shrimp trawl	23	35	32	41	1	1	24	2
Scallop dredge	245	206	176	177	162	165	216	309
Lobster trap	29	39	26	19	15	27	72	10
All other	171	295	221	179	137	220	576	382
Total	**75,334**	**67,779**	**72,384**	**72,734**	**71,649**	**71,517**	**90,775**	**104,325**

Table 484 - Groundfish landings by multispecies vessels by gear used, 1994-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Gear Type	1994	1995	1996	1997	1998	1999	2000	2001
Bottom trawl*	$69,496	$64,315	$64,621	$63,322	$69,001	$69,348	$77,463	$81,747
Bottom longline*	$6,593	$4,873	$3,343	$4,724	$5,389	$3,758	$2,912	$3,238
Hook and line*	$148	$782	$807	$1,045	$1,456	$1,193	$1,835	$1,922
Sink gillnet, total*	$17,233	$14,834	$13,156	$12,648	$11,383	$12,829	$12,272	$12,308
Day Gillnet	N/A	N/A	N/A	$7,463	$5,215	$5,893	$5,207	$6,621
Trip Gillnet	N/A	N/A	N/A	$2,975	$3,564	$3,987	$4,575	$4,251
Midwater trawl	$0	$0	$0	$0	$0	$1	$0	$0
Shrimp trawl	$30	$36	$38	$41	$1	$2	$9	$3
Scallop dredge	$269	$222	$185	$201	$194	$182	$168	$248
Lobster trap	$32	$42	$25	$21	$15	$38	$67	$10
All other	$223	$400	$269	$242	$176	$265	$580	$264
Total	**$94,025**	**$85,503**	**$82,444**	**$82,244**	**$87,614**	**$87,615**	**$95,306**	**$99,740**

Table 485 - Groundfish revenues by multispecies vessels by gear used, 1994-2001
Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

DAS Use by Gear Type
For this discussion, refer to Table 486.

Bottom Trawl:
In 1996 there were 480 active vessels in the bottom trawl sector, 85% of the total number of permitted bottom trawl vessels. The percentage of active vessels increased over the next five years, reaching 95% in 2001. DAS use by bottom trawl vessels increased steadily from 1996 to 2001. 51% of the DAS allocated to active permitted bottom trawl vessels were used by these vessels in 1996 and 72% of allocated DAS were used by active bottom trawl vessels in 2001.

Bottom Longline:
In 1996 there were 41 active vessels in the bottom longline sector, 89% of the total number of permitted bottom longline vessels. The percentage of active vessels increased over the next five years, reaching 93% in 2001. DAS use by bottom longline vessels generally increased from 1996 to 2001. 30% of the DAS allocated to active permitted bottom longline vessels were used by these vessels in 1996 and 65% of allocated DAS were used by active bottom longline vessels in 2001.

Hook and Line:
In 1996 there were 94 active vessels in the hook and line sector, 53% of the total number of permitted hook and line vessels. The percentage of active vessels increased over the next five years, reaching 64% in 2001. DAS use by hook and line vessels generally increased from 1996 to 2001. 9% of the DAS allocated to active permitted hook and line vessels were used by these vessels in 1996 and 31% of allocated DAS were used by active hook and line vessels in 2001.

Sink Gillnet:
In 1996 there were 140 active vessels in the sink gillnet sector, 89% of the total number of permitted sink gillnet vessels. The percentage of active vessels increased over the next five years, reaching 99% in 2001. DAS use by sink gillnet vessels increased from 1996 to 1997, decreased slightly through 1999 and increased again, reaching its highest level in 2001. 34% of the DAS allocated to active permitted sink gillnet vessels were used by these vessels in 1996 and 69% of allocated DAS were used by active sink gillnet vessels in 2001.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Gear Type		Total Number of Permitted Vessels with Allocated DAS	Total Days-at-Sea Allocated	Number of Permitted Vessels that Called In	DAS Allocated to Vessels that Called In	Total DAS Used by Vessels that Called In	% of total allocated DAS Used by Permitted Vessels that called in ((5)/(2)*100)	% of allocated DAS (to vessels that called in) Used by Permitted Vessels that Called In ((5)/(4)*100)
1995	Bottom Trawl	496	94,655	349	67,038	32,492	34	48
	Midwater Trawl	10	1,752	3	664	440	25	66
	Shrimp Trawl	59	10,849	48	8,949	3,415	31	38
	Bottom Longline	3	607	1	190	114	19	60
	Hook & Line	1	190	0	0	0	0	-
	Sink Gillnet	15	2,915	4	829	323	11	39
	Scallop Dredge	35	2,808	10	1,482	508	18	34
	Lobster Trap	2	380	0	0	0	0	-
	Other	148	26,800	25	4,543	1,235	5	27
	Total	**769**	**140,956**	**440**	**83,695**	**38,527**	**27**	**46**
1996	Bottom Trawl	564	80,283	480	69,488	35,630	44	51
	Midwater Trawl	9	1,357	4	711	376	28	53
	Shrimp Trawl	122	17,135	85	11,992	4,038	24	34
	Bottom Longline	46	6,285	41	5,729	1,744	28	30
	Hook & Line	176	24,464	94	13,066	1,151	5	9
	Sink Gillnet	157	22,075	140	19,696	6,640	30	34
	Scallop Dredge	43	3,459	13	1,390	342	10	25
	Lobster Trap	3	417	1	139	0	0	0
	Other	585	80,743	132	18,401	2,046	3	11
	Total	**1,705**	**236,218**	**990**	**140,612**	**51,968**	**22**	**37**
1997	Bottom Trawl	551	52,712	490	47,932	28,296	54	59
	Midwater Trawl	5	421	1	88	23	5	26
	Shrimp Trawl	112	10,372	95	8,880	5,181	50	58
	Bottom Longline	48	4,267	47	4,179	2,173	51	52
	Hook & Line	172	15,136	109	9,592	2,022	13	21
	Sink Gillnet	158	14,632	140	12,984	8,433	58	65
	Scallop Dredge	43	2,461	15	1,094	306	12	28
	Lobster Trap	4	352	1	88	16	5	18
	Other	620	54,917	192	17,068	3,014	5	18
	Total	**1,713**	**155,270**	**1,090**	**101,905**	**49,464**	**32**	**49**

Table 486 - Days-at-Sea Usage by Gear Type, 1995-2002

This table includes data from multispecies DAS trips as well as multispecies/monkfish DAS trips (in which the multispecies and monkfish clocks run concurrently). DAS totals include any adjusted gillnet DAS totals. Data Source: NMFS Enforcement DAS Call-In Database, NMFS Permit Database, Vessel Trip Report Database

Year	Gear Type	Total Number of Permitted Vessels with Allocated DAS	Total Days-at-Sea Allocated	Number of Permitted Vessels that Called In	DAS Allocated to Vessels that Called In	Total DAS Used by Vessels that Called In	% of total allocated DAS Used by Permitted Vessels that called in ((5)/(2)*100)	% of allocated DAS (to vessels that called in) Used by Permitted Vessels that Called In ((5)/(4)*100)
1998	Bottom Trawl	552	56,342	508	52,608	33,034	59	63
	Midwater Trawl	9	864	4	363	147	17	40
	Shrimp Trawl	60	5,696	52	4,962	2,587	45	52
	Bottom Longline	44	4,294	42	4,118	2,133	50	52
	Hook & Line	166	15,648	113	10,924	2,329	15	21
	Sink Gillnet	158	15,923	135	13,757	8,546	54	62
	Scallop Dredge	39	2,275	16	1,236	453	20	37
	Lobster Trap	2	196	1	98	13	7	14
	Other	606	55,751	191	18,349	3,693	7	20
	Total	**1,636**	**156,989**	**1,062**	**106,415**	**52,935**	**34**	**50**
1999	Bottom Trawl	539	55,179	504	51,863	32,641	59	63
	Midwater Trawl	8	761	4	369	204	27	55
	Shrimp Trawl	75	7,232	55	5,331	3,388	47	64
	Bottom Longline	38	3,734	36	3,538	1,988	53	56
	Hook & Line	159	15,487	95	9,245	1,891	12	20
	Sink Gillnet	156	15,594	154	15,398	9,103	58	59
	Scallop Dredge	34	1,829	16	1,137	426	23	37
	Lobster Trap	2	196	1	98	5	2	5
	Other	635	60,440	202	19,529	4,626	8	24
	Total	**1,646**	**160,452**	**1,067**	**106,506**	**54,271**	**34**	**51**
2000	Bottom Trawl	542	56,255	520	54,180	37,455	67	69
	Midwater Trawl	5	490	2	196	162	33	82
	Shrimp Trawl	52	4,919	42	4,034	2,337	48	58
	Bottom Longline	36	3,551	35	3,453	1,907	54	55
	Hook & Line	158	15,222	95	9,342	2,319	15	25
	Sink Gillnet	170	17,631	168	17,435	11,620	66	67
	Scallop Dredge	51	3,220	25	2,062	882	27	43
	Lobster Trap	2	108	1	98	17	16	18
	Other	633	59,324	194	18,957	4,592	8	24
	Total	**1,649**	**160,720**	**1,082**	**109,757**	**61,290**	**38**	**56**
2001	Bottom Trawl	549	56,989	520	54,414	38,922	68	72
	Midwater Trawl	2	247	1	149	138	56	93
	Shrimp Trawl	10	919	6	537	315	34	59
	Bottom Longline	29	2,824	27	2,628	1,708	60	65
	Hook & Line	176	17,036	112	10,862	3,380	20	31
	Sink Gillnet	187	20,007	185	19,811	13,608	68	69
	Scallop Dredge	69	4,811	35	3,035	1,412	29	47
	Lobster Trap	1	98	0	0	0	0	-
	Other	565	53,360	210	20,138	5,792	11	29
	Total	**1,588**	**156,290**	**1,096**	**111,572**	**65,275**	**42**	**59**
2002*	Bottom Trawl	513	35,043	482	34,349	25,596	73	75
	Midwater Trawl	2	133	1	105	97	73	93
	Shrimp Trawl	32	1,774	24	1,645	1,109	63	67
	Bottom Longline	24	1,406	23	1,388	768	55	55
	Hook & Line	125	3,758	73	2,798	1,161	31	41
	Sink Gillnet	185	12,571	183	12,535	9,310	74	74
	Scallop Dredge	62	2,054	24	1,170	596	29	51
	Lobster Trap	0	0	0	0	0	0	-
	Other	454	14,479	181	7,822	2,773	19	35
	Total	**1,397**	**71,218**	**991**	**61,812**	**41,410**	**58**	**67**

Table 486 - Days-at-Sea Usage by Gear Type, 1995-2002

Summary

Bottom trawls were the top gear indicated as primary gear type from 1995 to 2001, followed by hook and line vessels and sink gillnets, the majority of these day boats. Midwater trawls were indicated in very small numbers. The relative proportions of each gear type remained fairly consistent during the period, with the exception of shrimp trawls which decreased substantially as a percentage of the total.

Between 1994 and 2001, bottom trawls accounted for a large majority of total and groundfish landings in each year. Total bottom trawl landings decreased overall from 1994 to 2001 primarily as a result of restrictions in other fisheries, evident in the fact that groundfish landings by bottom trawls increased over this time period. Following bottom trawls, the next four top contributors to total landings were “other” gears, sink gillnets, scallop dredges, and midwater trawls. Sink gillnets landed the second highest percentage of groundfish but both total and groundfish landings by gillnets decreased from 1994 to 2001. Bottom longlines, which ranked third in contribution to groundfish landings, exhibited the greatest percent decline in landings of any of the gears. From 1994 to 2001, midwater trawl and scallop dredge total landings increased, while shrimp trawl total landings declined. Midwater trawl groundfish landings are extremely low in all years. Hook and line total landings generally trended upward from 1994 to 2001, with groundfish landings exhibiting a dramatic increase. Bottom longline landings decreased slightly over the period. Revenue trends generally mimicked landings trends from 1994 to 2001.

DAS use increased from 1996 to 2001 for each of the four primary gear types. Bottom trawls used the greatest percentage of allocated DAS from 1996 to 2001, while hook and line vessels utilized the smallest percentage of days allocated.

9.4.2.4.4 Fishing Activity by Home Port State

Data Caveats

Home Port vs. Principal Port

In order to examine dependence on the groundfish fishery by state, the number of vessels and their associated landings and revenues are reported primarily by home port state. Home port state is indicated on the permit and represents the state in which the associated vessel resides. Principal port is also indicated on the permit and represents the state in which the associated vessel reports the majority of its landings. This is declared by the permit holder. Principal port and home port may be one and the same or may differ. For example, a vessel which obtained its permit in Stonington, Connecticut may land its catch in Point Judith, Rhode Island. In this case, the home port state is Connecticut while the principal port state is Rhode Island. Principal port may also differ from principal port of *landing*, which is determined based on the actual port in which the vessel landed the majority of its catch over the year, as determined solely from dealer records. For example, a vessel may declare a principal port of Portsmouth, New Hampshire with the intention of landing the majority of its annual catch there but actually land a greater percentage of its catch in Gloucester, Massachusetts within a given fishing year. Principal port and principal port of landing are not discussed in the Affected Human Environment of Amendment 13. However, where home port was not reported or documented incorrectly, principal port state replaced home port state. The majority of the permits were associated with a true home port.

“Other” States

States in which the number of vessels made up less than 1% of the total number in each fishing year from 1996 to 2001 were combined into an “Other” category. The landings associated with these states are very low.

Number of Vessels by Home Port State

Fleet composition by state has remained relatively consistent for both active multispecies vessels in all fisheries and active multispecies vessels in the groundfish fishery from 1996 to 2001. The multispecies fleet is dominated by vessels with home ports in Massachusetts and Maine. The following tables provide a breakdown of percent of total number of vessels for each state averaged over the period from 1996 to 2001 (Table 487 and Table 488).

Home Port State	Average Percent of Total Vessels, 1996-2001
MA	42.1%
ME	13.8%
NY	10.3%
NJ	9.8%
RI	9.7%
NH	4.9%
VA	3.8%
NC	3.2%
CT	0.9%
All Others	each less than 1%

Table 487 - Composition of fleet (permitted multispecies vessels active in *any* fishery) by home port state, 1996-2001

Calculated using Table 489 and Table 490.

Home Port State	Average Percent of Total Vessels, 1996-2001
MA	51.1%
ME	12.6%
RI	10.6%
NY	9.7%
NJ	6.2%
NH	5.9%
VA	1.5%
NC	1.4%
CT	0.6%
All Others	each less than 1%

Table 488 - Composition of fleet (permitted multispecies vessels active in *groundfish* fishery) by home port state, 1996-2001

Calculated using Table 489 and Table 490.

New York, New Jersey and Rhode Island each contribute approximately 10% of the total number of permitted multispecies vessels active in any fishery (landings of any species). Massachusetts vessels make up over 50% of the permitted multispecies vessels active in the groundfish fishery, with Maine following at 12.6%. Rhode Island and New York again contribute about 10% of the total active groundfish vessels each, while New Jersey makes a lower contribution at 6.2%. New Hampshire contributes a greater percentage of vessels to the total number of multispecies vessels active in the groundfish fishery (almost 6%) than to the number of vessels active in any fishery (almost 5%). Connecticut vessels account for less than 1% of the multispecies fleet.

State	1996	1997	1998	1999	2000	2001
MA	943	862	817	816	779	855
ME	401	304	260	257	221	235
RI	200	190	189	198	186	204
NY	193	201	206	212	221	199
NJ	179	180	183	207	216	208
NH	107	93	96	92	102	104
VA	73	71	76	84	78	73
NC	59	55	59	60	68	78
CT	13	14	12	6	26	32
FL	9	8	9	5	4	7
MD	9	15	15	14	17	18
DE	6	5	9	9	9	5
Other	7	5	2	2	3	4
Total	**2199**	**2003**	**1933**	**1962**	**1930**	**2022**

Table 489 - Number of multispecies vessels active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

State	1996	1997	1998	1999	2000	2001
MA	716	655	639	638	652	687
ME	188	179	158	140	153	163
NY	123	135	134	128	123	116
RI	122	124	132	138	126	137
NJ	86	80	80	94	84	58
NH	75	65	74	70	90	90
VA	15	21	24	26	18	9
NC	13	16	20	17	18	27
DE	4	4	3	5	4	2
CT	3	3	6	2	17	17
MD	3	4	6	5	8	7
FL	2	1	1	2	3	0
Other	4	2	1	0	0	1
Total	**1354**	**1289**	**1278**	**1265**	**1296**	**1314**

Table 490 - Number of multispecies vessels active in the groundfish fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Average Length and Horsepower of Multispecies Vessels by Home Port State

Table 491 shows the average length and horsepower of multispecies vessels by homeport state. From 1994 to 2000, the average length of Massachusetts vessels has varied little, ranging from 40 feet to 42 feet. Average horsepower of Massachusetts vessels has remained stable, ranging from 340 to 350 between 1994 and 2000. In New Hampshire the average length steadily increased from 33 feet in 1994 to 39 feet in 2000. New Hampshire vessels also experienced a gradual increase in average horsepower from 298 to 367. Of the New England states, Connecticut and Rhode Island vessels have the greatest average length (between 40 and 50 feet). Overall, North Carolina and Virginia are home to the largest vessels, averaging approximately 70 feet. Vessels from Virginia have declined in average length from 1994 to 2000. In general, vessels homeported in states outside of New England had higher average horsepower than those in the New England states. This is particularly evident when comparing the average horsepower of

Massachusetts, Maine and New Hampshire vessels, which ranged from approximately 300 to 350, with that of New Jersey and Delaware vessels, which ranged from approximately 450 to 700. Additionally, larger vessels have home ports in southern states and at the southern range of mid-Atlantic states (North Carolina, Virginia, Florida) while smaller vessels reside in the northern Atlantic states (Massachusetts, New Hampshire, Maine).

Length							
State	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
NC	71.1	68.5	69	70	69	67.4	65
VA	68.1	70.3	70.5	66.3	62.2	56.8	56.8
FL	55.2	52.9	56	55.4	55	54.3	54.4
CT	52.9	54.4	42.3	42	42.9	43.5	45.3
NJ	48.6	48.7	51.3	51.3	51.9	51.2	51.2
DE	46.2	47.1	53.5	51	44.8	46.2	46.9
RI	45.4	45.7	47	47.6	48.6	48.5	47.1
MD	45.2	49	46.6	47.3	51.2	50.3	51.4
NY	41.8	42.8	43.2	42.3	42.6	42.4	42
MA	41	41.4	42	42.1	41.4	41	40.5
ME	39.3	39	39.7	41.4	40.6	40.6	39.6
NH	33.9	34.9	36.9	38.2	39.1	39	39.3
Horsepower							
State	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
DE	563.6	591.7	698	621	462.7	445.2	462.4
NJ	513.3	517.2	550.9	553.4	554.1	549.3	549.3
FL	506.6	485.8	548.8	592.1	589.4	653	524
NC	495.4	464.4	496	512.3	488.5	472.1	499.8
VA	471.8	479.2	503	487.1	472.1	461.9	465.7
CT	432	440.7	518.5	440.9	443.8	458.3	485.8
NY	402.1	413.2	415.5	406	421.2	411.8	418.9
RI	376.1	375.1	386.1	396.8	423.1	423.9	418.7
MA	343.5	348.4	354.2	357.6	351.8	348.2	350.5
MD	305.6	322.8	409.8	373.1	518	533.2	565.9
ME	300.9	304.3	318.3	337.9	328.9	332.7	333.8
NH	298.1	302.8	316.3	322.5	336.6	337.8	367.2

Table 491 - Average vessel length and horsepower by home port state, 1994-2000

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Note: This data was not updated for 2001. Current averages may be slightly different across all years due to updated and corrected data in the source databases.

Number of Vessels by Home Port State and Permit Category

The following tables provide insight into the way participants in different permit categories are distributed among states. These numbers represent permitted multispecies vessels active in any and all fisheries (not just active in the groundfish fishery). The values correspond to the totals in Table 489.

Vessels with home ports in Massachusetts and Maine together make up the overwhelming majority of category A vessels. On average, Massachusetts vessels compose 64% of the vessels in this category, this percentage decreasing slightly from 1996 to 2001. Maine contributed an average of 23.6% of the vessels from 1996-2001, this percentage increasing slightly over the time period. Between 1996 and 2001, Massachusetts and Maine vessels together made up 87.6% of the individual DAS vessels. During this time period, the percent of Massachusetts vessels of the total number decreased slightly, while increasing slightly in Maine. New Hampshire also increased participation in this permit category, increasing from 3 vessels in 1996 to 7 in 2001 (Table 492).

State	1996	1997	1998	1999	2000	2001
MA	95	99	87	82	80	79
ME	34	30	26	32	34	36
NY	7	6	5	2	1	2
RI	5	3	4	4	4	5
NH	3	3	6	7	7	7
DE	2	2	2	3	3	2
NC	1	1	0	0	0	0
CT	0	0	0	0	0	0
FL	0	0	0	0	0	0
MD	0	0	0	0	0	0
NJ	0	0	0	1	1	1
VA	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total	**147**	**144**	**130**	**131**	**130**	**132**

Table 492 - Number of permit category A (Individual DAS) multispecies vessels active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Category B (Fleet DAS) is the largest permit category. Again, it is dominated by Massachusetts vessels, averaging 41.2% of the total from 1996 to 2001. The proportion of Massachusetts vessels remained very consistent over this time period, while Maine's contribution decreased slightly and Connecticut's increased. Massachusetts, Maine, Rhode Island and New York vessels together compose 81.5% of the fleet on average over the time period (Table 493).

State	1996	1997	1998	1999	2000	2001
MA	449	425	393	388	362	363
ME	202	174	159	138	131	127
RI	127	129	125	126	115	121
NY	114	110	102	111	113	104
NJ	76	72	74	82	82	77
NH	59	63	60	56	57	46
NC	15	15	16	16	16	17
VA	11	11	10	8	7	7
CT	8	8	5	3	13	15
MD	6	6	6	5	5	6
DE	1	1	1	1	1	0
FL	1	2	2	1	1	1
Other	3	3	1	0	0	0
Total	**1072**	**1019**	**954**	**935**	**903**	**884**

Table 493 - Number of permit category B (Fleet DAS) multispecies vessels active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Category C (small vessel exemption) is a very small permit category, with a maximum of four participating vessels in any state for a given fishing year. This category is made up of vessels almost entirely homeported in Massachusetts and Rhode Island. From 1996 to 2001, Massachusetts averaged 2.8 vessels per year while Rhode Island averaged 2.5 (Table 494).

State	1996	1997	1998	1999	2000	2001
MA	4	2	2	3	3	3
RI	3	4	2	3	2	1
CT	0	0	0	0	0	0
DE	0	0	0	0	0	0
FL	0	0	0	0	0	0
MD	0	0	0	0	0	0
ME	0	0	0	0	1	0
NC	0	0	0	0	0	0
NH	0	1	1	1	1	0
NJ	0	0	0	0	0	0
NY	0	1	1	0	0	0
VA	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total	**7**	**8**	**6**	**7**	**7**	**4**

Table 494 - Number of permit category C (Small Vessel Exemption) multispecies vessels active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Vessels from Massachusetts make up between 72% and 81.3% of the category D (Hook gear) vessels from 1996 to 2001. This proportion has generally trended upward across the time period. New York vessels contribute the second highest participation level, followed by New Hampshire. The number of hook gear vessels in New Hampshire decreased from 5 in 1996 to 2 in 2001. In Rhode Island, the number increased from 1996 to 1997 but decreased from 1999 to 2000 after a period of relative consistency (Table 495).

State	1996	1997	1998	1999	2000	2001
MA	67	87	81	83	78	76
NY	9	10	12	14	10	10
NH	5	2	3	2	1	2
RI	5	8	8	9	5	5
ME	3	4	3	2	1	2
CT	2	2	0	0	1	2
FL	1	1	1	1	0	0
DE	0	0	0	0	0	0
MD	0	0	0	0	0	0
NC	0	0	0	0	0	1
NJ	0	0	0	1	0	0
VA	0	0	0	0	0	0
Other	1	0	0	0	0	1
Total	**93**	**114**	**108**	**112**	**96**	**99**

Table 495 - Number of permit category D (Hook Gear Only) multispecies vessels active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

In category E (combination vessels), Massachusetts vessels made up the greatest percentage of the total, this number remaining very consistent from 1996 to 2001 (between 24 and 25 boats). In 1996, both Virginia and New Jersey had six category E vessels. By 2000, this number had decreased to 3 vessels in New Jersey while remaining at 6 in Viriginia. Both states demonstrated further declines from 2000 to 2001. The number of category E vessels in North Carolina increased slightly from 1996 to 2001. With the exception of Massachusetts, New England vessels are poorly represented in this permit category (Table 496).

State	1996	1997	1998	1999	2000	2001
MA	25	24	24	24	24	25
NJ	6	5	3	3	3	2
VA	6	5	6	5	6	4
NC	2	2	2	3	3	5
RI	2	2	2	2	2	2
DE	1	0	0	0	0	0
ME	1	1	2	1	3	3
CT	0	1	2	0	3	2
FL	0	0	0	0	0	0
MD	0	0	0	0	0	0
NH	0	0	0	0	1	1
NY	0	0	0	0	0	0
Other	1	0	0	0	0	0
Total	**44**	**40**	**41**	**38**	**45**	**44**

Table 496 - Number of permit category E (Combination vessel) multispecies vessels active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

In 1996, 44.4% of category G (Large mesh, fleet DAS) vessels were from Massachusetts, this percentage increasing to 66.7% in 2000. The number of vessels in Rhode Island declined substantially across this time period, decreasing from 33% of the total number in 1996 to 3% of the total in 2001. New Hampshire increased its number of category G vessels five-fold between 2000 and 2001. In previous years, however, New Hampshire and New Jersey each contributed between 1 and 2 vessels in each year to the total (Table 497).

State	1996	1997	1998	1999	2000	2001
MA	4	7	10	9	16	34
RI	3	3	3	2	1	2
NH	1	1	1	1	2	10
NJ	1	1	1	1	1	4
CT	0	1	1	2	0	0
DE	0	0	0	0	0	0
FL	0	0	0	0	0	0
MD	0	0	0	0	1	2
ME	0	0	0	1	2	2
NC	0	0	0	0	0	2
NY	0	0	1	1	1	1
VA	0	1	0	0	0	1
Other	0	0	0	0	0	0
Total	**9**	**14**	**17**	**17**	**24**	**58**

Table 497 - Number of permit category G (Large mesh, fleet DAS) multispecies vessels active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Vessels in combined open access categories were distributed more evenly among states than vessels in any other permit category. Massachusetts vessels made up between 30 and 35% of the total number in each year from 1996 to 2001, followed by Maine and New Jersey. The number of open access vessels in Massachusetts increased over the time period from 186 in 1996 to 270 in 2001. New Jersey demonstrated the greatest percent increase in number of open access vessels, the number in 2001 75.8% greater than that in 1996. The number of open access vessels in Maine, however, decreased over the six years, with a period low of 48 vessels in 2000. The number of Maine vessels was variable between 1998 and 2001, fluctuating in those years but demonstrating a net decrease in numbers. Virginia and New York had comparable numbers of vessels, increasing between 1996 and 2001. The number of open access vessels in Rhode Island more than doubled from 1996 to 2001 (Table 498).

State	1996	1997	1998	1999	2000	2001
MA	186	214	214	224	215	270
ME	95	95	69	82	48	65
NJ	66	95	95	110	116	116
VA	51	54	60	71	65	61
NY	40	68	80	81	92	82
RI	32	38	44	51	57	67
NC	31	37	41	41	49	53
NH	24	22	23	23	32	37
FL	4	5	5	2	2	5
CT	3	2	4	1	8	12
DE	2	2	6	5	5	3
MD	2	9	9	9	11	9
Other	1	2	1	2	3	3
Total	**537**	**643**	**651**	**702**	**703**	**783**

Table 498 - Number of multispecies vessels in permit categories H, J & K (Open access, combined) that are active in any fishery by home port state, 1996-2001

Data Source: NMFS Permit Database. Data are for multispecies permit holders only. Data reported by fishing year--May 1 to April 30.

Landings and Revenues by Home Port State

Total and groundfish landings were highest for Massachusetts vessels in all years from 1996 to 2001. Massachusetts landings changed little between 1996 and 1997 but declined from 1997 to 2000. Total Massachusetts landings increased 32% from 2000 to 2001. Rhode Island and New Jersey contributed the second highest total landings during this period. For vessels with home ports in Rhode Island, landings increased 15.4% from 1996 to 1998, then decreased steadily from 115,016,000 pounds in 1998 to 86,590,000 pounds in 2001 (a decline of 24.7%). Total landings by New Jersey vessels increased 34.2% from 1996 to 1998, dropped from 107,158,000 pounds in 1998 to 81,878,000 pounds in 1999 and increased once again (16%) from 1999 to 2001. In Maine, landings fluctuated from 1996 to 2001 with a general increasing trend over the time period. The average annual percent change for vessels with home ports in Maine was 20.5%. (Table 499)

State	1996	1997	1998	1999	2000	2001
MA	152,568	154,493	146,750	124,629	131,754	173,959
RI	99,630	103,482	115,016	100,941	93,407	86,590
NJ	79,842	85,836	107,158	81,878	87,857	94,971
ME	57,735	116,809	80,185	97,244	92,655	106,347
NY	23,291	30,003	31,725	27,965	29,761	26,073
NC	10,727	13,548	16,427	15,639	16,132	18,972
NH	10,005	8,479	9,134	6,720	16,532	25,893
VA	7,655	7,491	9,840	8,587	10,600	11,409
DE	6,759	2,011	1,968	1,865	1,453	1,238
FL	2,325	1,076	443	233	267	509
MD	1,310	2,366	2,085	1,741	1,469	1,338
CT	169	343	1,834	294	3,227	2,601
Other	1,523	2,852	118	193	706	661
Total	**453,540**	**528,788**	**522,682**	**467,931**	**485,819**	**550,562**

Table 499 - Total landings by multispecies vessels by home port state, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

Massachusetts groundfish landings increased slightly from 1996 to 1997, decreased about 10% from 1997 to 1998, and rose from 42,312,000 pounds in 1998 to 61,687,000 pounds in 2001, an increase of 45.8%. Groundfish landings in Maine decreased an average of 4.8% annually from 1996 to 1999, a net 13.8% drop in landings during this time period, and increased an average of 21% annually from 1999 to 2001, with a net increase of 60% in these years. New Hampshire landings made up the third highest percentage of the total groundfish landings in 1996, nearly equaled landings in Rhode Island in 1995, and fell behind Rhode Island in the following years. While New Hampshire landings remained relatively constant from 1996 to 2001, Rhode Island landings increased or remained steady in every year, the landings in 2001 almost three times higher than those in 1996. New York landings also increased, from 1,323,000 pounds in 1996 to 4,096,000 pounds in 2000, dropping about 25% from 2000 to 2001. New Jersey landings varied in the early years of the time series, rising steadily after 1998 and falling again in 2001. Connecticut exhibited the most variable trend in landings over the time period, though generally increasing from 1998 through 2001. (Table 500)

State	1996	1997	1998	1999	2000	2001
MA	46,313	46,983	42,312	42,767	50,724	61,687
ME	15,284	14,180	13,306	13,188	18,047	21,139
NH	4,279	4,080	4,267	3,232	4,535	5,029
RI	2,972	4,213	6,142	6,090	8,486	8,666
NY	1,323	1,369	2,445	2,916	4,096	3,069
NJ	925	346	952	1,375	1,844	1,095
DE	835	882	831	952	988	796
VA	212	119	398	407	431	829
FL	140	238	121	53	2	0
CT	37	3	141	174	820	758
NC	15	321	732	360	798	1,254
MD	1	0	1	0	4	2
Other	47	0	0	0	0	0
Total	**72,384**	**72,734**	**71,648**	**71,517**	**90,775**	**104,325**

Table 500 - Groundfish landings by multispecies vessels by home port state, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

For the most part, changes in revenues reflect landings trends and have generally increased in all states *except* in Rhode Island and Massachusetts for total landings and Delaware and Florida for groundfish landings (Table 501 and Table 502). Massachusetts, Rhode Island, New Jersey and Maine generated the greatest *total* revenues from 1996 to 2001 while Massachusetts, Maine, New Hampshire and Rhode Island generated greatest *groundfish* revenues in those years. About 60% of total groundfish landings were brought in by Massachusetts vessels and 20% by Maine vessels across the time period. Permitted multispecies vessels with home ports in some southern New England and mid-Atlantic states, though contributing a high percentage of landings to the total, are less active than Maine and New Hampshire vessels in the groundfish fishery. Those states may be more dependent on non-groundfish fisheries such as scup, squid, mackerel and butterfish. Maine and Massachusetts, however, clearly are the largest stakeholders in the New England groundfish fishery with highest groundfish landings and revenues in 1996 through 2001.

In examining groundfish revenues as a percentage of total revenues, however, New Hampshire fisheries are most heavily dependent on groundfish, groundfish revenues increasing from 49% of total fishery revenues in 1996 to 60% in 1998, and decreasing to 48% in 2001 (Table 503). The dependence of multispecies vessels from Maine on groundfish as a percent of total fishery revenues was second to that of New Hampshire vessels, ranging from 42% to 55% and generally increasing over the time period. Delaware vessels ranked third in terms of dependence, followed by Massachusetts and Connecticut. Vessels with home ports in New York, Rhode Island and Florida all demonstrated similar levels of dependence on northeast multispecies. It is important to note that although the home ports of these vessels are associated with certain states, these are not necessarily the states in which the vessels are landing their catches. Instead, examining fishing activity by home port state is a means of predicting where the revenue streams are moving geographically.

State	1996	1997	1998	1999	2000	2001
MA	$153,434	$135,173	$130,633	$160,839	$171,463	$172,146
RI	$45,405	$46,800	$46,082	$54,549	$46,469	$39,281
NJ	$41,179	$43,257	$42,060	$51,992	$55,242	$51,598
ME	$38,342	$35,027	$29,539	$35,420	$37,032	$35,227
NY	$19,438	$23,484	$25,398	$23,569	$23,928	$21,650
VA	$19,367	$19,260	$18,735	$25,365	$31,376	$30,366
NH	$7,832	$6,977	$7,795	$6,724	$9,462	$9,801
NC	$7,376	$10,524	$12,777	$17,754	$21,131	$20,658
DE	$2,504	$2,459	$2,570	$3,292	$1,699	$1,263
FL	$2,458	$1,634	$1,221	$916	$1,251	$1,587
MD	$955	$1,560	$1,430	$1,356	$1,558	$1,208
CT	$357	$739	$470	$449	$3,754	$3,082
Other	$841	$944	$161	$494	$1,611	$1,249
Total	**$339,489**	**$327,839**	**$318,869**	**$382,718**	**$405,977**	**$389,118**

Table 501 - Total revenues by multispecies vessels by home port state, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

State	1996	1997	1998	1999	2000	2001
MA	$53,852	$55,185	$53,973	$53,729	$54,377	$60,021
ME	$16,579	$14,866	$14,957	$16,248	$18,834	$19,378
NH	$3,858	$3,666	$4,646	$3,401	$4,579	$4,719
RI	$3,699	$4,686	$7,347	$7,004	$8,483	$8,253
NY	$1,676	$1,732	$2,982	$3,316	$4,207	$3,058
NJ	$1,119	$429	$1,111	$1,513	$1,702	$915
DE	$1,056	$987	$976	$1,251	$1,016	$796
VA	$280	$159	$556	$497	$455	$818
FL	$176	$211	$129	$44	$1	$0
CT	$74	$3	$171	$185	$799	$667
NC	$18	$321	$765	$427	$848	$1,113
MD	$1	$0	$1	$0	$4	$2
Other	$57	$0	$0	$0	$0	$0
Total	**$82,444**	**$82,244**	**$87,613**	**$87,615**	**$95,306**	**$99,740**

Table 502 - Groundfish revenues by multispecies vessels by home port state, 1996-2001

Data Source: NMFS Permit and Dealer Databases. Data are for multispecies permit holders only. Data reported by fishing year—May 1 to April 30. ***Revenues expressed in thousands of 1999 dollars; Landings in thousands of pounds.***

State	1996	1997	1998	1999	2000	2001
NH	49.3	52.5	59.6	50.6	48.4	48.1
ME	43.2	42.4	50.6	45.9	50.9	55.0
DE	42.2	40.1	38.0	38.0	59.8	63.0
MA	35.1	40.8	41.3	33.4	31.7	34.9
CT	20.7	0.4	36.4	41.2	21.3	21.6
NY	8.6	7.4	11.7	14.1	17.6	14.1
RI	8.1	10.0	15.9	12.8	18.3	21.0
FL	7.2	12.9	10.6	4.8	0.1	0
NJ	2.7	1.0	2.6	2.9	3.1	1.8
VA	1.4	0.8	3.0	2.0	1.5	2.7
NC	0.2	3.0	6.0	2.4	4.0	5.4
MD	0.1	0	0	0	0.3	0.2

Table 503 - Home port state groundfish dependence by multispecies vessels (groundfish revenues over total revenues)

Calculated from Table 501 and Table 502.

DAS Use by Home Port State

Table 504 describes DAS-use by state. These data illustrate the relative changes in the distribution of fishing activity on a regional basis. Because not all vessels were in the DAS program prior to the 1997 fishing year, 1995 and 1996 data may not reflect the entire groundfish fleet operating during those years. All of the New England states increased their use of allocated DAS after Amendment 7 (1996). Active vessels in Maine and New Hampshire have used a higher percentage of allocated DAS than vessels in other states since 1997. Both Maine and New Hampshire used 70% or more of their allocated DAS in 2001. Active vessels in New York and New Jersey have used a lower percentage of allocated DAS than vessels in other states since 1997. In 2001, active vessels in New York and New Jersey used 36% and 29% of their allocated DAS, respectively.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
State (Homeport)		Total Number of Permitted Vessels	Total Days-at-Sea Allocated	Number of Permitted Vessels that Called In	DAS Allocated to Vessels that Called In	Total DAS Used by Vessels that Called In	% of DAS Used by Permitted Vessels ((5)/(2)*100)	% of DAS Used by Permitted Vessels that Called In ((5)/(4)*100)
1995	Maine	57	11,127	39	7,988	4,555	41	57
	New Hampshire	7	1,175	4	795	206	18	26
	Massachusetts	401	74,538	299	57,213	30,517	41	53
	Rhode Island	60	11,302	34	6,332	817	7	13
	Connecticut	5	950	3	570	116	12	20
	New York	110	20,181	39	6,978	1,074	5	15
	New Jersey	34	5,912	7	1,330	64	1	5
	Other	95	15,771	15	2,489	1,178	7	47
	Total	**769**	**140,956**	**440**	**83,695**	**38,527**	**27**	**46**

Table 504 - Days-at-Sea Usage by Home Port State, 1995-2002

This table includes data from multispecies DAS trips as well as multispecies/monkfish DAS trips (in which the multispecies and monkfish clocks run concurrently). DAS totals include any adjusted gillnet DAS totals. Data Source: NMFS Enforcement DAS Call-In Database, NMFS Permit Database

State (Homeport)		Total Number of Permitted Vessels	Total Days-at-Sea Allocated	Number of Permitted Vessels that Called In	DAS Allocated to Vessels that Called In	Total DAS Used by Vessels that Called In	% of DAS Used by Permitted Vessels ((5)/(2)*100)	% of DAS Used by Permitted Vessels that Called In ((5)/(4)*100)
1996	Maine	183	26,228	86	12,742	5,165	20	41
	New Hampshire	66	9,276	49	6,913	1,852	20	27
	Massachusetts	984	137,270	625	89,453	36,225	26	40
	Rhode Island	96	13,236	62	8,510	2,742	21	32
	Connecticut	17	2,363	10	1,390	371	16	27
	New York	189	25,663	100	13,601	2,757	11	20
	New Jersey	53	7,119	19	2,514	375	5	15
	Other	117	15,063	39	5,489	2,481	16	45
	Total	**1,705**	**236,218**	**990**	**140,612**	**51,968**	**22**	**37**
1997	Maine	177	16,644	98	9,692	5,359	32	55
	New Hampshire	68	6,222	54	4,990	2,645	43	53
	Massachusetts	996	91,363	687	64,809	33,431	37	52
	Rhode Island	96	8,534	71	6,302	2,755	32	44
	Connecticut	19	1,704	9	824	318	19	39
	New York	183	15,950	107	9,431	2,351	15	25
	New Jersey	55	4,708	16	1,408	321	7	23
	Other	119	10,145	48	4,449	2,285	23	51
	Total	**1,713**	**155,270**	**1,090**	**101,905**	**49,464**	**32**	**49**
1998	Maine	197	18,807	107	10,736	5,931	32	55
	New Hampshire	70	6,870	54	5,402	3,156	46	58
	Massachusetts	909	88,738	636	64,814	33,126	37	51
	Rhode Island	105	10,044	76	7,420	3,766	37	51
	Connecticut	20	1,861	9	863	363	20	42
	New York	171	15,855	111	10,598	3,262	21	31
	New Jersey	64	5,710	18	1,646	537	9	33
	Other	100	9,104	51	4,936	2,793	31	57
	Total	**1,636**	**156,989**	**1,062**	**106,415**	**52,935**	**34**	**50**
1999	Maine	212	20,986	112	11,543	7,442	35	64
	New Hampshire	74	6,705	53	4,988	2,879	43	58
	Massachusetts	895	88,174	619	62,362	33,068	38	53
	Rhode Island	119	11,418	82	8,074	4,237	37	52
	Connecticut	19	1,885	11	1,101	452	24	41
	New York	178	17,196	109	10,563	3,197	19	30
	New Jersey	72	6,934	41	3,943	1,212	17	31
	Other	77	7,154	40	3,932	1,784	25	45
	Total	**1,646**	**160,452**	**1,067**	**106,506**	**54,271**	**34**	**51**

Table 504 - Days-at-Sea Usage by Home Port State, 1995-2002(cont.)

State (Homeport)		Total Number of Permitted Vessels	Total Days-at-Sea Allocated	Number of Permitted Vessels that Called In	DAS Allocated to Vessels that Called In	Total DAS Used by Vessels that Called In	% of DAS Used by Permitted Vessels ((5)/(2)*100)	% of DAS Used by Permitted Vessels that Called In ((5)/(4)*100)
2000	Maine	226	22,071	128	13,274	8,414	38	63
	New Hampshire	80	7,714	60	6,146	4,428	57	72
	Massachusetts	880	86,843	608	62,470	36,269	42	58
	Rhode Island	124	12,039	82	8,129	4,648	39	57
	Connecticut	19	1,849	11	1,065	629	34	59
	New York	166	16,019	111	10,719	3,496	22	33
	New Jersey	82	7,712	45	4,436	1,542	20	35
	Other	72	6,472	37	3,518	1,863	29	53
	Total	**1,649**	**160,720**	**1,082**	**109,757**	**61,290**	**38**	**56**
2001	Maine	213	21,141	130	13,517	9,397	44	70
	New Hampshire	76	7,714	61	6,254	4,582	59	73
	Massachusetts	846	84,014	629	64,651	39,609	47	61
	Rhode Island	127	12,452	86	8,510	4,701	38	55
	Connecticut	17	1,606	13	1,214	647	40	53
	New York	155	14,932	94	9,138	3,248	22	36
	New Jersey	89	8,367	50	4,990	1,428	17	29
	Other	65	6,065	33	3,299	1,664	27	50
	Total	**1,588**	**156,290**	**1,096**	**111,572**	**65,275**	**42**	**59**
2002	Maine	178	9,598	118	8,136	5,943	62	73
	New Hampshire	73	4,293	56	3,844	2,576	60	67
	Massachusetts	751	40,577	566	36,275	24,525	60	68
	Rhode Island	107	5,848	83	5,187	3,739	64	72
	Connecticut	17	871	12	732	370	42	50
	New York	135	5,095	91	4,161	2,112	41	51
	New Jersey	79	2,866	41	2,013	1,108	39	55
	Other	57	2,069	24	1,465	1,037	50	71
	Total	**1,397**	**71,218**	**991**	**61,812**	**41,410**	**58**	**67**

Table 504 - Days-at-Sea Usage by Home Port State, 1995-2002 (cont.)

Summary

Fleet composition by state has remained relatively consistent for both active multispecies vessels in all fisheries and active multispecies vessels in the groundfish fishery from 1996 to 2001. The multispecies fleet is dominated by vessels with home ports in Massachusetts and Maine. In general, larger vessels have home ports in southern states and at the southern range of mid-Atlantic states (North Carolina, Virginia, Florida) while smaller vessels reside in the northern Atlantic states (Massachusetts, New Hampshire, Maine).

Massachusetts vessels dominated all limited access permit categories throughout the period. From 1996 to 2001, the percent of Category A (Individual DAS) vessels from Massachusetts decreased slightly while increasing slightly in Maine. New Hampshire also increased participation in this permit category. The number of Massachusetts vessels in the largest permit category, Category B (Fleet DAS), remained fairly constant from 1996 to 2001. Maine, Rhode Island and New York vessels together with those from Massachusetts made up the majority of this category over the time period. Category C (small vessel exemption) is a very small permit category, with most vessels from Massachusetts and Rhode Island across all years. After Massachusetts, New York and New Hampshire made up the majority of Category D (Hook gear) vessels. In category E (combination vessels), the number of Massachusetts vessels remained very consistent from 1996 to 2001. With the exception of Massachusetts, New England vessels are poorly represented in this permit category. The number of category G (Large mesh, Fleet DAS) vessels in Rhode Island, the second most represented state, declined substantially across this time period while the number of New Hampshire vessels increased sharply from 2000 to 2001. Vessels in combined open access categories were distributed more evenly among states than vessels in limited access categories. New Jersey demonstrated the greatest percent increase in number of open access vessels, while these vessels generally diminished in Maine. The number of open access vessels in Rhode Island more than doubled from 1996 to 2001.

Total and groundfish landings were highest for Massachusetts vessels in all years from 1996 to 2001. Landings in Massachusetts, Rhode Island and New Jersey, the three highest contributing states to total landings, declined from around 1997 or 1998 to 1999 or 2000. In Maine, total landings fluctuated from 1996 to 2001 with a general increasing trend over the time period. Groundfish landings were highest in Massachusetts and Maine from 1996 to 2001, generally decreasing from 1996 or 1997 to 1998 or 1999. Groundfish landings in both states demonstrated increases in the later years of the time period. While New Hampshire landings remained relatively constant from 1996 to 2001, Rhode Island landings increased or remained steady in every year, the landings in 2001 almost three times higher than those in 1996. New York landings also generally increased while New Jersey landings varied in the early years of the time series, rose steadily after 1998 and fell again in 2001. Connecticut exhibited the most variable trend in landings over the time period, though generally increasing from 1998 through 2001.

For the most part, changes in revenues reflect landings trends and have generally increased in all states *except* in Rhode Island and Massachusetts for total landings and Delaware and Florida for groundfish landings. Massachusetts, Rhode Island, New Jersey and Maine generated the greatest *total* revenues from 1996 to 2001 while Massachusetts, Maine, New Hampshire and Rhode Island generated greatest *groundfish* revenues in those years. Permitted multispecies vessels with home ports in some southern New England and mid-Atlantic states, though contributing a high percentage of landings to the total, are less active than Maine and New Hampshire vessels in the groundfish fishery. Those states may be more dependent on non-groundfish fisheries such as scup, squid, mackerel and butterfish. Maine and Massachusetts, however, clearly are the largest stakeholders in the New England groundfish fishery with highest groundfish landings and revenues in 1996 through 2001. In examining groundfish revenues as a percentage of total revenues, however, New Hampshire fisheries are most heavily dependent on groundfish, followed by those in Maine.

All of the New England states increased their use of allocated DAS after Amendment 7 (1996). Active vessels in Maine and New Hampshire have used a higher percentage of allocated DAS than vessels in other states since 1997. Active vessels in New York and New Jersey have used a lower percentage of allocated DAS than vessels in other states since 1997.

9.4.2.4.5 Description of the GOM Cod Fishery 1996-2001

Since adoption of Amendment 7, six framework adjustments were adopted to reduce fishing mortality on GOM cod (frameworks 20, 25, 26, 27, 31, and 33). The distributional impacts of these management actions are often debated and bear on the design of the proposed alternatives, as some argue that Amendment 13 should redress inequities caused by earlier management actions. Appendices of the annual MSMC report included tables showing activity in the GOM and GB cod fisheries. Numbers of vessels by size and gear, as well as the annual landings of cod for various sectors, are summarized in these tables. The data from earlier reports were combined into summary tables to illustrate trends in the GOM cod fishery over time. Although these data summarize landings of GOM cod, they do not reflect all the impacts of recent management measures on fishermen. For example, these results do not show changes in the landing of other species that resulted from the regulations.

Table 505 shows the number of unique vessels that reported landing at least one pound of GOM cod for fishing years 1996 (implementation of Amendment 7) through 2001. The number of vessels participating in this fishery declined from 754 in FY 1996 to 487 in FY 1999, but rose to 537 by FY 2001. Much of the decline can be attributed to vessels that landed less than 1,000 pounds of GOM cod annually: in FY 1996, 281 vessels participated at this low level, but only 78 in FY 2001, a decline of 203 vessels. Also, vessels landing more than 80,000 pounds of GOM cod declined. In FY 1996, 42 vessels landed more than 80,000 lbs., but the number of vessels in this category declined rapidly to only 14 vessels in FY 97 and 2 vessels in FY 2000 before increasing slightly to 4 vessels in FY 2001. Forty three percent of GOM cod landings in FY 1996 were on vessels that landed over 80,000 pounds annually, while only 4 percent of the GOM cod in FY 2000 came from these vessels.

A description of the amount of GOM cod landed by gear and vessel size is summarized in the MSMC reports. Table 506 shows that trawl vessel landings of GOM cod have declined 35 percent since FY 1996, while gillnet landings declined 36 percent over the same period. GOM cod landings by Hook Gear vessels declined 67%. Within the gear sectors, distinct differences occur among vessel size classes. Small trawl vessels are the only category that had higher GOM cod landings in FY 2001 than in FY 1996, showing an 84 per cent increase. Prior to FY 2000, GOM cod landings from small trawl vessels steadily decreased, but a large increase in the last two years resulted in the highest landings over the period. Inspection of tables in earlier reports reveals that this increase occurred largely due to increased landings in New Hampshire and Massachusetts ports (primarily Gloucester). Larger trawl vessels have had significant reductions in GOM cod landings – 64 percent for vessels of 51 – 150 GRT, and 91 percent for vessels over 150 GRT. All gillnet vessel sizes have reduced GOM cod landings, ranging from a 36 percent reduction for vessels 50 GRT and under to 30 percent for gillnet vessels between 51 and 150 GRT. Almost all hook gear landings are from vessels 50 GRT or less. The hook gear sector has reduced GOM cod landings by 65 percent since FY 1996, but hook gear accounted for only 6% of total GOM cod landings in 1996-1997.

The distribution of GOM cod landings across vessel size/gear categories has changed since FY 1996 (Table 507). Trawl vessels over 150 GRT landed over 12% of the GOM cod in FY 1996, but now land only 2%. In FY 1996, trawlers of 51-150 GRT (31 percent) and gillnet vessels of 50 GRT or less (33 percent) accounted for the bulk of GOM cod landings. In FY 2001, 84 percent of GOM cod was landed by vessels of 50 GRT and under, 39 percent by small trawl vessels (who have nearly tripled their percentage of GOM cod since FY 1996) and 33 percent by small gillnet vessels. Hook gear vessels landed 6 percent of the GOM cod in FY 1997 but landed only 2 percent in FY 2001.

Table 508 summarizes landings by gear (trawl, gillnet, and hook gear only) and state of landing. The greatest percentage decline from FY 1996 to FY 2001 occurred for landings of GOM cod in Maine (46%) followed closely by Massachusetts (38%). GOM cod landings in New Hampshire declined 19%. As a result of these differences, the share of GOM landings by state has changed. Landings in Massachusetts now account for 55% of GOM cod landings, Maine accounts for 25%, and New Hampshire accounts for 20%. Within gear sectors and states, all sectors have rebounded somewhat from the low landings in FY 1999, but for the three major states, only trawl vessels landing in New Hampshire have seen a real increase (69%) in GOM cod landings since FY 1996.

To summarize:

- The number of vessels reporting landing GOM cod has declined by 29 percent since FY 1996. There has been a 10 percent increase in the number of vessels participating in this fishery since FY 1999.
- Within the GOM cod fishery, there are fewer vessels landing very large or very small amounts of cod than in FY 1996.
- With respect to the impact of the framework adjustments on the cod catch of different gears, the adjustments have been remarkably even-handed for two of three major gear types. The change in GOM cod catch of trawl (-35%) and gillnet (-36%) vessels between FY 1996 and FY 2001 is nearly identical. Hook gear vessels, however, suffered reduced landings the most (68%) and now account for only 2 percent of GOM cod landings compared to 6% of total landings in 1997.
- The change in cod catch by vessel size has not been even- handed, with smaller vessel sizes generally benfiting from lower reductions in their GOM cod catch. Vessels over 150 GRT reduced their GOM cod catch by 91 percent, and vessels of 51-15- gross tons reduced catch by 61 percent. These changes are probably due to a combination of regulatory restrictions and increased opportunities for larger vessels as GB haddock and yellowtail flounder stocks rebuilt. Small vessels have only reduced their cod catch by 7 percent, in large measure because small trawl vessels (50 GRT and under) have significantly increased landings of GOM cod since FY 1996. By contrast, gillnet vessels less than 150 gross tons have had GOM cod landings reduced by approximately one-third.

Annual Cod Landings (in ths. Lbs.)	FY 1996			FY 1997			FY 1998			FY 1999			FY 2000			FY2001		
	Num. of Vsls	% of Vsls	Cod %	Num. of Vsls	% of Vsls	Cod %	Num. of Vsls	% of Vsls	Cod %	Num. of Vsls	% of Vsls	Cod %	Num. of Vsls	% of Vsls	Cod %	Num. of Vsls	% of Vsls	Cod %
>0-1	281	37	1	208	30	1	165	30	1	140	29	2	77	15	0	78	15	0
>1-5	145	19	3	148	22	4	93	17	4	152	31	14	99	20	4	78	15	2
>5-10	92	12	5	80	12	6	78	14	9	93	19	21	76	15	8	76	14	5
>10-20	67	9	8	113	17	18	93	17	19	70	14	32	100	20	19	97	18	14
>20-30	43	6	8	43	6	12	53	10	19	22	5	17	69	14	21	86	16	20
>30-40	29	4	8	27	4	11	36	6	18	8	2	9	45	9	20	36	7	12
>40-50	23	3	8	20	3	10	15	3	9	0	0	0	21	4	12	34	6	14
>50-60	11	1	5	12	2	7	9	2	7	0	0	0	12	2	9	24	4	13
>60-70	10	1	5	11	2	8	6	1	6	0	0	0	6	1	5	18	3	11
>70-80	11	1	6	8	1	7	4	1	4	1	0	2	0	0	0	6	1	4
>80	42	6	43	14	2	16	2	0	3	1	0	3	2	0	2	4	1	4
TOTAL	**754**			**684**			**554**			**487**			**507**			**537**		

Table 505 – Annual GOM cod landings, FY 1996 through FY 2000. (Source: NMFS VTR and Dealer Database, as reported in MSMC reports).

Pounds of GOM Cod Landings ('000s)						
Trawl						
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY2001
< 51 GRT	2,176	2,327	1,970	887	2,669	3,995
51-150 GRT	5,027	3,105	1,494	632	1,243	1,802
> 150 GRT	2,039	960	303	151	236	185
Total	9,242	6,392	3,767	1,670	4,148	**5,983**
Gillnet						
< 51 GRT	5,415	3,852	2,486	937	2,808	3,443
51-150 GRT	592	411	260	192	350	416
> 150 GRT	2	0	0	0	0	0
Total	6,009	4,263	2,746	1,129	3,158	**3,858**
Hook						
< 51 GRT	724	665	195	128	161	254
51-150 GRT	48	27	27	0	0	0
> 150 GRT	0	39	0	0	0	0
Total	772	731	222	128	161	**254**

Table 506 – GOM cod landings, by vessel size and three primary gears. (Source: NMFS VTR and dealer database, as reported in MSMC reports)

Percent of GOM Cod Landings						
Trawl						
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY2001
< 51 GRT	13	20	28	29	35	39
51-150 GRT	31	27	21	21	16	17
> 150 GRT	12	8	4	5	3	2
Total	56	55	53	55	54	**58**
Gillnet						
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY2001
< 51 GRT	33	33	36	31	37	33
51-150 GRT	4	4	4	6	5	4
> 150 GRT	0	0	0	0	0	0
Total	37	36	40	37	42	**37**
Hook						
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	
< 51 GRT	4	6	3	4	2	2
51-150 GRT	0	0	0	0	0	0
> 150 GRT	0	0	0	0	0	0
Total	5	6	3	4	2	**2**

Table 507 – Percent of GOM cod landings, by gear and vessel size. Percentage does not add to 100 due to exclusion of "other gears". (Source: NMFS VTR and dealer database, as reported in MSMC reports)

Pounds of GOM Cod Landings						
	Otter Trawl					
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY2001
Maine	2,920	2,170	1,016	582	1,113	1,460
New Hampshire	600	548	573	120	728	992
Massachusetts	5,716	3,669	2,178	966	2,305	3,522
Rhode Island	4	5	0	1	2	7
Other Northeast	2	0	0	0	1	1
Total	9,242	6,392	3,767	1,669	4,149	5,983
	Gillnet					
Maine	1,482	816	536	204	675	1,005
New Hampshire	1,915	1,503	760	239	999	1,044
Massachusetts	2,609	1,942	1,450	686	1,482	1,805
Rhode Island	1	0	0	0	1	0
Other Northeast	2	2	0	0	1	4
Total	6,009	4,263	2,746	1,129	3,158	3,858
	Hook					
Maine	157	91	52	17	12	11
New Hampshire	0	9	0	0	0	3
Massachusetts	615	631	169	111	149	241
Rhode Island	0	0	1	0	0	0
Other Northeast	0	0	0	0	0	0
Total	772	731	222	128	161	254
	Total (Trawl/Gillnet/Hook Gear)					
Maine	4,559	3,077	1,604	803	1,800	2,476
New Hampshire	2,515	2,060	1,333	359	1,727	2,039
Massachusetts	8,940	6,242	3,797	1,763	3,936	5,568
Rhode Island	5	5	1	1	3	7
Other Northeast	4	2	0	0	2	5
Total	16,023	11,386	6,735	2,926	7,468	10,095
	Total (Percent)					
Maine	28%	27%	24%	27%	24%	25%
New Hampshire	16%	18%	20%	12%	23%	20%
Massachusetts	56%	55%	56%	60%	53%	55%
Rhode Island	0%	0%	0%	0%	0%	0%
Other Northeast	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Table 508 – GOM cod landings by port state for three primary gears. (Source: NMFS VTR and dealer data, as reported in MSMC reports)

9.4.2.4.6 Effects of *Conservation Law Foundation et al. v. Donald Evans et al.* on Fishing Activity

On December 28, 2001, a judge granted the plaintiff's motion for summary judgment in the case of *CLF et al. v. Evans*. The court determined the defendants had not complied with the Sustainable Fisheries Act in Framework Adjustment 33 to the FMP. Specifically, the court determined that the framework violates the overfishing, rebuilding, and bycatch provisions of the SFA, while Amendment 9 violates the bycatch provisions of the SFA. After several months of discussion with parties to the lawsuit, the court issued an order establishing interim management measures and giving NMFS until August, 2003 to adopt measures that are in full compliance with all provisions of the M-S Act. This deadline was later extended to May 1, 2004 after NMFS discovered possible problems with the trawl survey.

The interim measures approved by the court included an additional year round closed area on Cashes Ledge, modifications to the seasonal closed areas, several changes to gear requirements, revised possession limits, and a limitation on the use of DAS to the maximum DAS used by a permit during the 1996 through 2000 fishing years reduced by 20 percent. The expected impacts of these interim measures were analyzed in NMFS 2002. A preliminary review of the actual impact of the measures is summarized below.

When evaluating changes from FY 2001 to FY 2002, the buyout of 222 active limited access permits at the end of FY 2001 must be considered. The number of vessels removed by the buyout are shown below for gear, length, and homeport state.

Home Port State	Number of Permits
CT	4
FL	2
MA	105
MD	2
ME	42
NC	1
NH	5
NJ	15
NY	22
PA	3
RI	19
VA	2
Total	222

Permit Category	Number of Permits
A	1
B	160
C	5
D	56

Length	
Less than 30	41
30 to Less than 50	150
50 to less than 75	24
75+	7

Figure 254 – Number of limited access groundfish permits removed by the 2002 vessel buyout program

DAS Allocations

The DAS allocations that resulted from the court order are shown in section 9.4.2.4. Table 509 compares the number of permits and DAS allocated in fishing year 2002 to fishing year 2001. Forty-six percent of the DAS allocated in fishing year 2001 have been allocated in fishing year 2002. The differences in DAS allocated to various permit categories are similar to the DAS use patterns over the past five years with the exception of the individual and combination DAS permit categories. As a group, individual vessels have used over 85 percent of their allocated DAS since fishing year1997, but under the court order received only 78 percent of the DAS allocated in fishing year 2001. Combination vessels show the opposite trend. They have generally used about half their allocations since 1997, but under the court order received 71 percent of their 2001 allocation. Individual and large mesh permit categories were allocated less DAS than were used in fishing year 2001, while the other categories received more DAS than used in 2001.

With respect to the distribution of allocated DAS by permit category, a larger percentage of allocated DAS are held by individual permit holders in FY 2002 compared to 2001. All other permit categories have a smaller number of DAS. This change follows the patterns of DAS used in recent years: individual vessels, as a group, have used a larger percentage of their allocated DAS. Allocations to each permit holder may not follow the same patterns as those for permit categories as a group. When evaluating these changes, the results of the permit buyback by permit category should be considered.

Categories	Number of Permitted Vessels in 2002/Permitted Vesels in 2001	2002 Allocated DAS as a percentage of 2001 Allocated DAS	DAS Used FY 2001	DAS Allocated FY 2002	DAS Used FY 2002	Percent of Total DAS Allocated in FY 2001	Percent of Total DAS Allocated in FY 2002
Individual	101%	78%	16,276	13,884	12,329	11%	19%
Fleet	88%	43%	41,095	47,977	24,695	72%	67%
Combination	98%	70%	1,102	1,637	663	2%	2%
Hook Gear	69%	22%	2,309	3,607	875	11%	5%
Large Mesh	98%	57%	4,493	4,113	2,849	5%	6%
Total	88%	46%	65,275	71,218	41,410	100%	100%

Table 509 – 2002 DAS allocations as a percentage of 2001. (Source: NMFS NERO)

Allocations of DAS by vessel homeport state (as listed on the vessel's permit) can also be examined to see if the court order may affect the distribution of fishing activity (Table 510). New Hampshire vessels received the highest percentage of their 2001 allocation (56 percent), followed by Connecticut (54 percent). Maine, Massachusetts, and Rhode Island received similar percentages (45-48 percent). New York (34 percent) and New Jersey (34 percent) are the states receiving the lowest percentage of their FY 2001 allocations. These allocations are very similar to the percent of allocated DAS used in fishing year 2001 for all states. Massachusetts vessels increased their share of the total by 3 percent, while the court order reduced New York's share of the total by 3 percent. New Hampshire and Rhode Island gained slightly, and Maine and New Jersey lost slightly. Overall, the court order does not appear to have significantly changed the distribution of DAS allocations by homeport state. Only New Hampshire vessels were allocated fewer DAS in FY 2002 than were used in FY 2001.

State (Homeport)	Number of Permitted Vessels in 2002/Permitted Vessels in 2001	2002 Allocated DAS as a percentage of 2001 Allocated DAS	DAS Used FY 2001	DAS Allocated FY 2002	DAS Used FY 2002	Percent of Total DAS Allocated to each state FY 2001	Percent of Total DAS Allocated to each state FY 2002
Maine	84%	45%	9,397	9,598	5,943	14%	13%
New Hampshire	96%	56%	4,582	4,293	2,576	5%	6%
Massachusetts	89%	48%	39,609	40,577	24,525	54%	57%
Rhode Island	84%	47%	4,701	5,848	3,739	8%	8%
Connecticut	100%	54%	647	871	370	1%	1%
New York	87%	34%	3,248	5,095	2,112	10%	7%
New Jersey	89%	34%	1,428	2,866	1,108	5%	4%
Other	88%	34%	1,664	2,069	1,037	4%	3%
Total	88%	46%	65,275	71,218	41,410	100%	100%

Table 510 – Comparison of 2002 DAS allocations to 2001 DAS allocations, based on homeport state. (Source: NMFS NERO)

Table 511 shows DAS changes based on vessel length. All vessel length classes received more DAS in FY 2002 than used in FY 2001. There does, however, appear to be a shift in the allocation from smaller to larger vessels. The two smaller size classes have a smaller share of the DAS allocation as a result of the court order, while the two larger classes have a larger share. Vessels in the 50 to 74 foot size class "gained" the largest share of DAS. This shift follows the fact that in recent years larger vessels have used a higher percentage of their DAS.

Categories	Number of Permitted Vessels in 2002/Permitted Vessels in 2001	2002 Allocated DAS as a percentage of 2001 Allocated DAS	DAS Used FY 2001	DAS Allocated FY 2002	DAS Used FY 2002	Percent of Total DAS Allocated FY 2001	Percent of Total DAS Allocated FY 2002
1 - 29 feet	75%	22%	1,474	2,518	526	7%	4%
30 - 49 feet	84%	39%	30,299	33,731	16,736	56%	47%
50 - 74 feet	96%	59%	23,139	24,068	15,956	26%	34%
75+ feet	97%	63%	10,364	10,901	8,192	11%	15%
unknown	0%	0%	0	0	0	0%	0%
Total	88%	46%	65,275	71,218	41,410	100%	100%

Table 511 - Comparison of 2002 DAS allocations to 2001 DAS allocations based on vessel length class. (Source: NMFS NERO)

In summary, the court order changed the distribution of allocated DAS by permit category and vessel length class. It had only minor effects on the distribution of DAS by homeport state, with New York and New Jersey the states most affected by the allocation. In almost every category, more DAS were allocated in 2002 than were used in 2001. The sole exception is the individual DAS permit category, which received fewer DAS than were used in FY 2001. Impacts on individual vessels within a category may differ from these broad patterns.

DAS Use

DAS use for the period May 2002 through April 2003 is shown in Table 474 (permit category), Table 480 (length), Table 486 (primary gear), and Table 504 (homeport state). There is a 37 percent decline in DAS used in the groundfish fishery in FY 2002, with 41,169 DAS used by all permit categories. This compares to 65,276 DAS used during the same period the previous year. This decline in effort is the result of less fishing activity, changes in DAS counting (prohibition on front-loading the clock, limitations on DAS use May – July, etc.), and the re-distribution of DAS. All permit categories, states, and vessel length classes were allocated more DAS in FY 2002 than they used.

There were only minor changes in the precentage of the total DAS used by each permit category, and the distribution of DAS use is similar to what took place between FY 1996 and FY 2001. For example, individual permit category vessels used between 25 and 42 percent of the total DAS used – in FY 2002, this category used 30 percent. Similarly, fleet vessels used between 55 and 66 percent of the total DAS from FY 1996 through FY 2001, and used 60 percent of the total in FY 2002. Examining DAS use by length, homeport state, and gear also shows that FY 2002 DAS use did not differ appreciably from the patterns of use from FY 1996 through FY 2001. In conclusion, while the DAS allocations in FY 2003 were distributed differently than in previous years, the distribution of DAS use was unchanged.

Landings

Preliminary landings information by stock area is only available for the months of May through December. Table 512 compares this period in FY 2001 to FY 2002 for selected stocks. The measures implemented by the court order clearly reduced landings for most stocks, but there is considerable variation from stock to stock. Witch flounder and white hake landings declined by about 10 percent Landings for both cod stocks are about one-third lower in 2002 than in 2001. GOM haddock, GB yellowtail flounder, and SNE/MA winter flounder landings have declined over 40 percent. In contrast to the general trend of reduced landings, GB haddock landings increased nearly 50 percent and GB winter flounder landings increased by nearly 30 percent.

Tthis preliminary analysis does not explain the differences in reductions between between stocks. On the surface, DAS restrictions imposed by the court order might have been expected to reduce landings of offshore GB sotcks more than inshore stocks, but that trend is not well-defined as GB cod has the same reduction as GOM cod, and GB winter flounder and haddock landings increased. Some of these differences might be explained by increased catch rates as a result of stock increases, as both GB haddock and GB winter flounder are increasing in size. Liberalization of the GB haddock trip limit may also have counter-acted some of the court ordered restrictions.

Revenues

Revenue information for 2002 was compared to revenue information for 2001. Revenues received and pounds landed for eleven groundfish species are shown by state in Table 513 and Table 514. Only the period May – December was examined. This is the period of 2002 affected by the FW 33 court order for which data is available due to lags in the reporting system. Some data for 2002 may not yet be entered, so these revenues should be considered preliminary. All revenues are shown in constant 2001 dollars.

Landings for these eleven groundfish species for the May – December period declined from about 70 million pounds in 2001 to 55 million pounds in 2002. Revenues, however, only declined by 3 percent, indicating a substantial adjustment in prices received for groundfish. Groundfish revenues in Rhode Island increased by 48 percent, Massachusetts revenues showed no change, while all other states showed a decline. Maine (-12 percent) and New Hampshire (-8 percent) showed similar reductions, as did New York (-48 percent) and New Jersey (-53 percent). Connecticut data is incomplete. Closer inspection of the table shows that in general revenues from cod and white hake declined, revenues from haddock increased, and revenues for other species were similar in each year. Those states that increased revenue from haddock generally faired better than the others.

Groundfish revenues for the top ten groundfish landing ports are shown in Table 515. While there was some shuffling in the ranking of the ports, the same ports for this period were in the top ten each year. Point Judith (31 percent), Boston (5 percent), Gloucester (3 percent) and New Bedford (1 percent) increased goundfish revenues in the May – December 2002 period compared to the same period in 2001. Chatham (-6 percent), Hampton NH (-9 percent), Scituate and Provincetown (-12 percent), Portland (-14 percent) and Portsmouth (-20 percent) saw declines in revenues. Once again, those ports that were able to increase haddock revenues fared better than those ports that did not.

Table 516 shows 2001 and 2002 groundfish revenues for the May – December period for principal gear types in constant dollars. Trawl gear revenues were unchanged, with declines in cod, yellowtail flounder, plaice and pollock offset by gains from haddock, white hake, and grey sole. Gillnet revenues declined by 2 percent. Longline and handline revenues declines by 47 percent and 43 percent respectively. Cod revenues for these gears were nearly reduced in half.

		May 01 - Dec 01	May 02 - Dec 02	2002/2001
Cod	GULF OF MAINE	7,823	5,290	68%
	OTTER TRAWL	4,394	2,801	64%
	GILLNET	2,877	2,276	79%
	HOOK	125	68	54%
	OTHER GEARS	428	145	34%
	GEORGES BANK	14,514	9,694	67%
	OTTER TRAWL	9,659	7,452	77%
	GILLNET	2,636	1,506	57%
	HOOK	1,337	442	33%
	OTHER GEARS	880	294	33%
Haddock	GULF OF MAINE	1,559	903	58%
	OTTER TRAWL	1,415	809	57%
	GILLNET	129	69	53%
	HOOK	11	24	218%
	OTHER GEARS	1	1	100%
	GEORGES BANK	5,735	8,446	147%
	OTTER TRAWL	5,579	8,297	149%
	GILLNET	76	116	153%
	HOOK	77	33	43%
Yellowtail	CAPE COD/GOM	4,335	3,502	81%
	OTTER TRAWL	3,821	3,429	90%
	GILLNET	510	72	14%
	HOOK	0	0	
	OTHER GEARS	4	2	50%
	GEORGES BANK	4,638	2,629	57%
	OTTER TRAWL	4,559	2,627	58%
	GILLNET	0	0	
	HOOK	0	0	
	OTHER GEARS	77	1	1%
	SNE/ MID-ATLANTIC	607	587	97%
	OTTER TRAWL	603	586	97%
	GILLNET	1	0	0%
	HOOK	0	0	
	OTHER GEARS	1	1	100%

Table 512 – Comparision of FY 2001 and FY 2002 preliminary landings for selected stocks, May - December

		May 01 - Dec 01	May 02 - Dec 02	2002/2001
White Hake	ALL AREAS	5,186	4,624	89%
	OTTER TRAWL	4,102	2,894	71%
	GILLNET	1,693	1,694	100%
	HOOK	12	30	250%
	OTHER GEARS	7	7	100%
Plaice	ALL AREAS	7,236	4,753	66%
	OTTER TRAWL	7,157	4,741	66%
	GILLNET	77	11	14%
	HOOK	0	0	
	OTHER GEARS	1	1	100%
Winter Flounder	GULF OF MAINE	1,128	971	86%
	OTTER TRAWL	855	920	108%
	GILLNET	272	51	19%
	HOOK	0	0	
	OTHER GEARS	0	0	
	GEORGES BANK	3,710	4,484	121%
	OTTER TRAWL	3,706	4,482	121%
	GILLNET	0	0	
	HOOK	0	0	
	OTHER GEARS	3	2	67%
	SNE/ MID-ATLANTIC	7,707	4,647	60%
	OTTER TRAWL	7,619	4,610	61%
	GILLNET	47	30	64%
	HOOK	1	1	100%
	OTHER GEARS	38	5	13%
Witch Flounder	ALL AREAS	4,479	4,181	93%
	OTTER TRAWL	4,397	4,160	95%
	GILLNET	71	20	28%
	HOOK	0	0	
	OTHER GEARS	10	1	10%

Table 512 (cont.) - Comparision of FY 2001 and FY 2002 preliminary landings for selected stocks, May – December

2001	Massachusetts	Maine	New Hampshire	Rhode Island	New York	Connecticut	New Jersey	Grand Total
COD, ATLANTIC	17,075,971	2,026,058	1,766,657	127,408	15,348	18,998	94	21,030,558
WINTER (BLACKBACK)	8,412,212	16,045	23,087	934,303	611,700	211,741	316,021	10,525,414
WITCH (GREY SOLE)	3,286,664	1,441,660	140,623	121,007	6,673	9,813	27,338	5,033,788
FLOUNDER, YELLOWTAIL	6,920,472	43,112	77,776	327,119	102,686	64,497	2,348	7,538,026
AMERICAN PLAICE	2,581,689	3,394,018	102,543	51,878	140	8,330		6,138,598
SAND DAB (WINDOWPANE)	3,282		95	6,686	11,444	418	24,179	46,104
HADDOCK	5,977,467	2,000,858	86,426	82,921	7	36,061		8,183,740
HAKE, WHITE	859,015	1,439,154	200,832	14,977	624	20,572		2,535,176
HALIBUT, ATLANTIC	12,178	32,141	6,858	458		233		51,868
REDFISH	89,373	122,134	12,622	2,020	713		11	226,873
POLLOCK	1,777,876	1,511,722	532,671	21,502	376	263	92	3,844,502
Total	46,996,199	12,026,902	2,950,190	1,690,279	749,711	370,926	370,083	65,154,647
2002	**Massachusetts**	**Maine**	**New Hampshire**	**Rhode Island**	**New York**	**New Jersey**	**Connecticut**	**Grand Total**
COD, ATLANTIC	14,208,203	1,797,499	1,508,773	191,289	2,794	0	0	17,708,557
WINTER (BLACKBACK)	8,746,557	47,905	18,378	1,092,024	321,182	138,778	88	10,365,861
WITCH (GREY SOLE)	3,817,488	1,263,277	234,011	91,154	759	20,883	0	5,427,572
FLOUNDER, YELLOWTAIL	6,232,851	65,874	115,205	572,273	55,405	3,966	39	7,045,613
AMERICAN PLAICE	2,212,243	2,758,430	97,320	73,581	0	0	0	5,141,573
SAND DAB (WINDOWPANE)	4,703	0	55	5,189	7,845	9,808	0	27,600
HADDOCK	8,975,428	1,281,335	68,332	318,718	7	0	8	10,643,828
HAKE, WHITE	930,531	1,727,185	214,500	13,154	135	0	4,159	2,889,664
HALIBUT, ATLANTIC	14,717	32,309	6,141	349	0	0	0	53,515
REDFISH, NK	117,177	97,669	10,196	1,799	260	0	0	227,100
POLLOCK	1,737,686	1,466,736	428,762	16,670	106	62	0	3,650,023
Total	46,997,582	10,538,218	2,701,671	2,376,201	388,492	173,497	4,295	63,180,906
Change in Groundfish Revenues	0%	-12%	-8%	41%	-48%	-53%	-99%	-3%

Table 513 – Revenues from major groundfish species for May – December, 2001 and 2002. Constant dollars (2001). Total exceeds state amounts because only states with significant groundfish landings shown. (Source: NMFS dealer data, unpublished)

2001	Massachusetts	Maine	New Hampshire	Rhode Island	New York	Connecticut	New Jersey	Grand Total
COD, ATLANTIC	15,723,126	1,663,505	1,479,579	120,596	12,157	17,999	59	19,017,042
WINTER (BLACKBACK)	10,182,004	18,582	29,645	1,059,811	610,393	300,069	346,933	12,547,875
WITCH (GREY SOLE)	2,880,733	1,299,902	111,251	141,914	6,374	15,406	23,246	4,478,843
FLOUNDER, YELLOWTAIL	8,774,428	62,052	110,913	416,071	103,226	112,448	2,209	9,581,379
AMERICAN PLAICE	3,016,815	3,978,423	138,214	81,388	70	21,089		7,235,999
SAND DAB (WINDOWPANE)	17,143		363	13,245	29,575	1,597	50,965	112,888
HADDOCK	4,727,970	1,503,441	55,896	82,999	13	28,520		6,398,839
HAKE, WHITE	1,527,427	2,382,339	351,297	34,369	1,761	49,481		4,346,685
HALIBUT, ATLANTIC	5,378	8,089	2,719	181		110		16,477
REDFISH,	233,079	296,351	45,043	6,709	1,499		18	582,699
POLLOCK	2,761,210	2,190,984	708,038	28,528	623	695	110	5,690,188
Total	49,849,313	13,403,668	3,032,958	1,985,811	765,691	547,414	423,540	70,008,914
2002	**Massachusetts**	**Maine**	**New Hampshire**	**Rhode Island**	**New York**	**New Jersey**	**Connecticut**	**Grand Total**
COD, ATLANTIC	10,803,612	1,303,379	1,018,879	190,500	1,962			13,318,332
WINTER (BLACKBACK)	8,634,569	53,597	15,263	913,656	256,645	112,562	60	9,987,436
WITCH (GREY SOLE)	2,968,943	986,977	205,522	83,509	515	15,606		4,261,072
FLOUNDER, YELLOWTAIL	6,036,766	55,213	107,220	476,722	51,995	3,377	57	6,731,350
AMERICAN PLAICE	2,020,780	2,594,607	96,293	82,639				4,794,319
SAND DAB (WINDOWPANE)	9,100		169	12,701	18,173	19,078		59,221
HADDOCK	7,139,620	956,198	44,954	278,346	7		10	8,419,135
HAKE, WHITE	1,132,938	2,043,743	267,312	20,445	216		10,635	3,475,289
HALIBUT, ATLANTIC	4,336	6,903	1,830	127				13,196
REDFISH,	167,745	174,594	14,336	3,665	400			360,740
POLLOCK	2,010,389	1,491,232	388,782	18,627	130	49		3,909,209
Total	40,928,798	9,666,443	2,160,560	2,080,937	330,043	150,672	10,762	55,329,299

Table 514 – Landed weight (pounds) of major groundfish species, May – December, 2001 and 2002. Total exceeds state amounts because only states with significant groundfish landings shown. (Source: NMFS dealer data, unpublished)

	New Bedford MA	Gloucester MA	Portland ME	Chatham MA	Boston MA	Portsmouth NH	Point Judith RI	Scituate MA	Hampton/Seabrook NH	Provincetown MA	Grand Total
COD, ATLANTIC	5,944,691	4,503,868	1,492,676	3,191,217	611,229	632,698	29,542	451,792	808,926	268,671	17,935,310
WINTER (BLACKBACK)	7,281,134	311,496	14,164	69,309	148,413	10,043	737,410	174,050	9,781	191,418	8,947,218
WITCH (GREY SOLE)	1,147,917	1,212,321	990,146	74,651	407,604	62,682	70,157	52,030	50,751	152,932	4,221,191
FLOUNDER, YELLOWTAIL	5,439,992	606,607	39,302	29,923	67,937	13,029	282,847	288,482	58,171	231,250	7,057,540
AMERICAN PLAICE	1,054,480	723,682	2,485,009	7,968	579,021	45,802	13,631	24,500	43,042	115,411	5,092,546
SAND DAB (WINDOWPANE)	2,662	238		36		18	1,065	107	30	1	4,157
HADDOCK	3,073,350	2,090,490	1,897,864	126,893	546,971	71,268	28,832	35,776	9,357	41,580	7,922,381
HAKE, WHITE	105,671	577,273	1,273,601	8,676	135,823	172,705	4,722	8,031	5,587	635	2,292,724
HALIBUT, ATLANTIC	5,979	4,644	8,691	541	409	5,207	46		97	317	25,931
REDFISH	16,086	44,885	115,593	716	26,504	11,481	452	600	723		217,040
POLLOCK	205,122	1,148,016	1,358,196	132,517	144,650	369,958	1,132	36,330	74,119	6,500	3,476,540
Total	24,277,084	11,223,520	9,675,242	3,642,447	2,668,561	1,394,891	1,169,836	1,071,698	1,060,584	1,008,715	57,192,578
2002	**New Bedford MA**	**Gloucester MA**	**Portland ME**	**Chatham MA**	**Boston MA**	**Point Judith RI**	**Portsmouth NH**	**Hampton NH**	**Scituate MA**	**Provincetown MA**	**Grand Total**
COD, ATLANTIC	5,251,734	3,792,530	1,375,838	2,580,974	448,976	51,559	709,995	415,765	466,035	142,436	15,235,842
WINTER (BLACKBACK)	7,503,594	472,450	47,334	79,698	39,602	910,655	10,908	1,480	135,253	237,491	9,438,464
WITCH (GREY SOLE)	1,003,567	1,769,758	787,459	148,942	376,479	36,684	137,403	17,080	52,278	108,323	4,437,973
FLOUNDER, YELLOWTAIL	4,635,611	695,975	63,414	15,316	43,177	412,323	97,969	2,030	139,014	317,536	6,422,364
AMERICAN PLAICE	860,328	581,933	1,888,120	21,155	595,549	26,053	50,629	17,622	27,886	52,284	4,121,560
SAND DAB (WINDOWPANE)	4,480	96	0	66	18	2,370	6	15	0	0	7,050
HADDOCK	4,889,840	2,527,593	1,219,417	343,658	963,122	84,132	44,835	15,147	88,801	19,765	10,196,309
HAKE, WHITE	68,801	671,870	1,525,804	7,787	163,407	3,687	12,664	189,792	5,132	349	2,649,293
HALIBUT, ATLANTIC	3,618	7,951	11,532	497	1,527	163	65	4,561	425	218	30,558
REDFISH	16,241	66,786	88,075	1,467	31,765	795	1,623	8,350	164	56	215,323
POLLOCK	272,190	994,957	1,300,366	233,944	134,825	2,384	43,847	298,502	31,366	7,810	3,320,191
Total	24,510,004	11,581,900	8,307,359	3,433,503	2,798,446	1,530,805	1,109,943	970,344	946,354	886,267	56,074,926
Change in Groundfish Revenues	1%	3%	-14%	-6%	5%	31%	-20%	-9%	-12%	-12%	-2%

Table 515 – Revenues from groundfish species for the May – December period, 2001 and 2002, top ten ports. Constant dollars (2001). (Source: NMFS dealer data, unpublished)

Species	Bottom Trawl	Gillnet	Longline	Handline	Scallop Dredge
May – December, 2001					
COD, ATLANTIC	12,948,010	5,054,482	1,607,337	1,349,232	18,589
FLOUNDER, WINTER (BLACKBACK)	10,059,388	388,876	4,973	10,011	21,738
FLOUNDER, WITCH (GREY SOLE)	4,822,086	183,049	5	1,928	12,088
FLOUNDER, YELLOWTAIL	7,005,364	381,095	75	9,748	136,644
FLOUNDER, AMERICAN PLAICE	5,993,699	129,795	7	1,495	5,374
FLOUNDER, SAND DAB (WINDOWPANE)	45,041	270		26	
HADDOCK	7,731,263	302,965	114,545	9,683	171
HAKE, WHITE	1,629,627	826,851	62,025	589	
HALIBUT, ATLANTIC	24,495	11,566	4,301	10,651	
REDFISH, NK (OCEAN PERCH)	188,765	37,533	100	269	
POLLOCK	1,766,664	1,999,466	18,406	33,297	
Total	52,214,402	9,315,948	1,811,774	1,426,929	194,604
May – December, 2002					
COD, ATLANTIC	11,117,088	4,982,922	817,975	711,557	48,613
FLOUNDER, WINTER (BLACKBACK)	10,032,990	253,272	16,061	8,468	28,710
FLOUNDER, WITCH (GREY SOLE)	5,238,302	157,090	1,924	2,936	2,197
FLOUNDER, YELLOWTAIL	6,755,483	243,772	3,226	7,815	30,565
FLOUNDER, AMERICAN PLAICE	5,063,411	63,254	84	2,072	4,291
FLOUNDER, SAND DAB (WINDOWPANE)	27,073	96	2	68	0
HADDOCK	10,047,831	478,287	75,040	17,353	23,247
HAKE, WHITE	1,879,347	973,016	24,146	11,096	182
HALIBUT, ATLANTIC	24,679	14,323	582	13,686	0
REDFISH, NK (OCEAN PERCH)	185,918	39,969	620	465	128
POLLOCK	1,691,699	1,899,186	20,015	36,682	2,266
Total	52,063,822	9,105,187	959,676	812,199	140,199
Percent Change	0%	-2%	-47%	-43%	-28%

Table 516 - Revenues from groundfish species for the May – December period, 2001 and 2002, principal gears only. Constant dollars (2001). (Source: NMFS dealer data, unpublished)

9.4.2.5 Capacity Reduction

Fishing capacity is the level of output a fishing fleet is able to produce given specified conditions and constraints. Maximum fishing capacity results when all fishing capital is applied over the maximum amount of available (or permitted) fishing time, assuming that all variable inputs are utilized efficiently. Excess capacity in the Northeast multispecies fishery has been addressed in several ways. The expanded Northeast Fishing Capacity Reduction Program (FCRP) was initiated in September 1996 after a brief pilot program which resulted in the removal of 11 vessels from the fishery. Congress later made $10 million available for implementing a multispecies permit buyout program that would target removal of some latent effort by 2002. Latent effort, often measured in unused DAS, has been of particular concern because of its potential to significantly increase capacity in the fishery. DAS may not be used by vessels for a number of reasons, including the choice not to fish or fishing in another fishery while retaining a multispecies permit.

The Report to Congress on Northeast Multispecies Harvest Capacity and Impact of Northeast Fishing Capacity Reduction, prepared by NMFS in December 2001, discusses the effects of the FCRP from 1996 to 2000. Vessel activity was analyzed in the Report to Congress by means of two indices: (a) the Capital Inventory Index (CII), which provides an estimate of the total amount of capital, weighted by vessel characteristics, that exists in the Northeast multispecies fishery at any given time; and (b) Estimated Fishing Capacity (EFC), which is defined in terms of expected catch in 100,000-pound units.

In general, while there were some measurable benefits of the FCRP, most positive effects were difficult to separate from those of Amendment 7, implemented in 1996. The FCRP did, however, remove 79 vessels in 1996 and 1997 that were more active than most of the remaining vessels. In 1997, 10% of the physical capital, as measured by the CII, was removed in comparison to the 1996 limited access baseline. 5% of fishing capacity, as measured by the EFC, was removed in comparison to this same baseline. Based on 1997 DAS allocations, the FCRP removed 5% of 1997 allocated DAS. These efforts probably resulted in a short-term reduction in fishing mortality, although the long-term effects are less certain. Substantial latent capacity remains and may be in the process of re-entry into the fishery, indicated by the fact that the EFC utilization rate in 2000 (36%) was the highest of all years from 1996 to 2000.

The New England Fishery Management Council created an ad hoc capacity committee in 1999 to further examine ways to eliminate excess capacity from the multispecies fishery. Their recommendations were incorporated into the development of management alternatives in Amendment 13 that focus on reducing capacity.

9.4.2.6 Spatial and Seasonal Distribution of Fishing Effort on Gulf of Maine and Georges Bank Cod

Changes in the spatial and temporal distribution of fishing effort on cod in the Gulf of Maine and Georges Bank from 1996 to 2000 were observed by examining the landings and days absent associated with a sample of 30 minute squares within the region. The NMFS Logbook (VTR) database was queried to create a dataset which linked landings and days absent with area fished in Georges Bank (GB) and the Gulf of Maine (GOM) on a trip by trip basis for the years 1996 through 2000. For each logbook entry, area fished was translated into a particular 30 minute square (1,190.25 square miles) in the Gulf of Maine or Georges Bank. The numbered grid of 30 minute squares used to evaluate spatial fishing effort is shown in Figure 255.

Figure 255 - Map of 30' squares in the Gulf of Maine and Georges Bank

Year-round and seasonal closed areas, DAS reductions, and trip limit changes may have all contributed to changes in cod landings and fishing effort. Beginning with Framework 25, a series of "rolling closures" or closures of blocks for short periods of time (1-2 months) were instituted in the Gulf of Maine. A complete description of these and other closures is available in section 1.2 (Summary of Current Measures) of the Multispecies Monitoring Committee's 2001 Report to the New England Fishery Management Council. These and other closures resulted in fishing effort shifts across the region as fishermen moved out of newly closed areas into open fishing grounds.

Logbooks may not always provide complete and accurate information about the multispecies fishery. Logbook data can be rife with inaccuracies due to human recording errors both at sea and in the transferring of information from paper to an electronic format. For this reason, it is important that definitive conclusions about fishing effort in the multispecies fishery are not drawn on the basis of information recorded in logbooks.

Landings

For the Gulf of Maine and Georges Bank, the 30' squares that were most important to the groundfish fishery were identified as those which were among the top ten most heavily fished squares in at least one year from 1996 to 2000. The percentages of total Gulf of Maine and Georges Bank cod landings attributed to fishing effort in the most important 30' squares are presented graphically to illustrate fishing effort shifts (Figure 256 and Figure 257).

In 1996, fishing in block 132 in the Gulf of Maine accounted for the highest percentage of cod landings, followed by blocks 129 and 124 (Figure 256). From 1997 to 2000, the percentage of cod landings in block 129 decreased. Effort also decreased slightly in block 132 which remained the second greatest contributor to landings from 1997 to 2000, after block 124. By 1998, fishing effort in block 124 had expanded to account for nearly 30% of the total cod landings in the Gulf of Maine. While effort in block

132 remained relatively stable from 1997 to 2000, it fluctuated slightly in block 124. The percentage of total cod landings more than doubled in block 124 from 1996 to 1998, decreased slightly in 1999 and rose again nearly to its 1998 level in the year 2000. Effort in block 139 decreased from 1996 to 2000 and most other blocks exhibited only minor effort shifts over the time period described. These data suggest that a moderate shift in effort to areas further inshore occurred from 1996 to 2000.

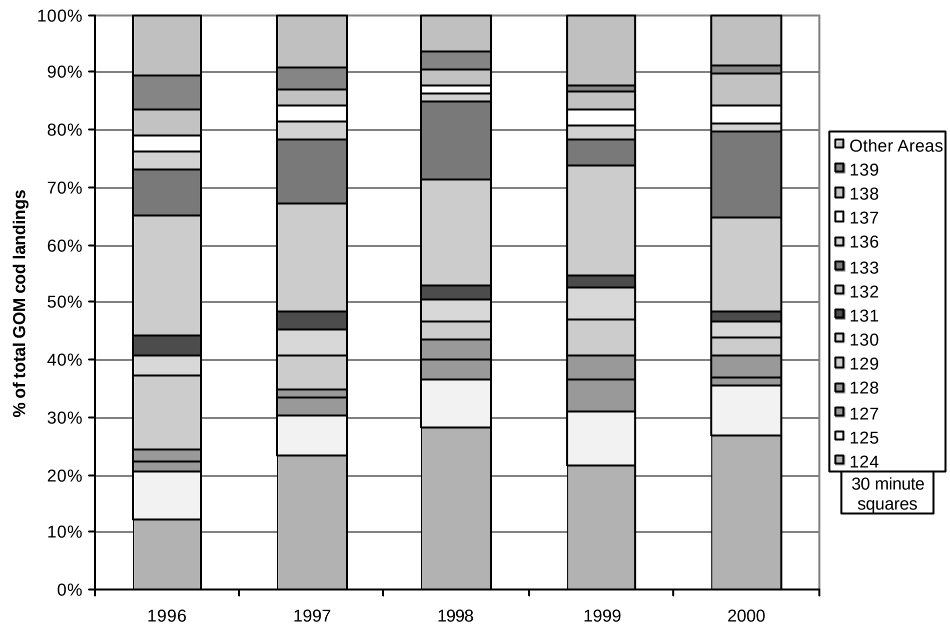


Figure 256 - Percentage of total cod landings attributed to fishing effort in the Gulf of Maine (by 30' squares), 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

On Georges Bank, fishing in block 98 accounted for the highest percentage of total cod landings from 1996 to 2000 (Figure 257). Effort in this block was highest during the five year period in 1999, contributing to 30% of total cod landings, but decreased to about 20% in 2000. Effort in blocks 110 and 111 decreased between 1996 and 2000, while generally increasing in blocks 80, 81 and 118. The pattern of expanding and contracting effort in block 113 mirrored that in block 111 from 1996 to 1998. However, in 1999 and 2000 the percentage of cod landings contributed by effort in block 111 decreased while increasing in block 113. This change suggests that some fishing effort may be moving further inshore. As in the Gulf of Maine, effort in most other blocks remained relatively stable. In Georges Bank, most of the fishing effort is concentrated at the western edge of Closed Area I and the northern and eastern edges of Nantucket Lightship Closed Area. Fishing effort on Georges Bank appears to be more broadly distributed than in the Gulf of Maine, with many blocks associated with similar proportions of cod landings.

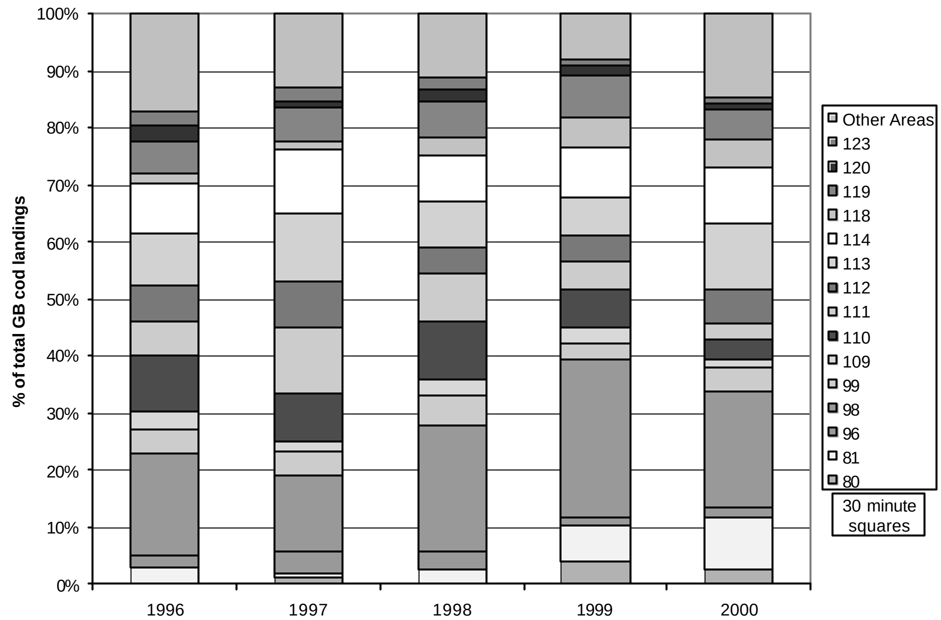


Figure 257 - Percentage of total cod landings attributed to fishing effort on Georges Bank (by 30' squares), 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

Days Absent
The method of analysis described above was also used to examine the distribution of days absent by vessels fishing for cod in the Gulf of Maine and Georges Bank. Days absent are the days recorded in vessel trip reports (logbooks) as days fished. Days absent are not necessarily equivalent to days-at-sea (DAS) because the way they are recorded in logbooks differs among individuals. Some fishermen record days absent as they do DAS, indicating the times called in and out as recorded on the DAS clock, while others record days absent by calendar day. The only way to link days fished with area fished is through examination of logbook data. DAS as documented by NMFS are not considered in these analyses.

As expected, the spatial distribution of fishing effort measured in days absent in the Gulf of Maine mirrored the pattern of landings in the 30' squares (Figure 258). Days absent that were fished in blocks 124 and 132 exceeded days fished in other blocks. Percent of days absent by vessels fishing for cod increased slightly from 1996 to 2000 in blocks 128 and 138. In general, the distribution of percentage of days absent among the most heavily fished blocks in the Gulf of Maine was more even than the distribution of percentage of cod landings.

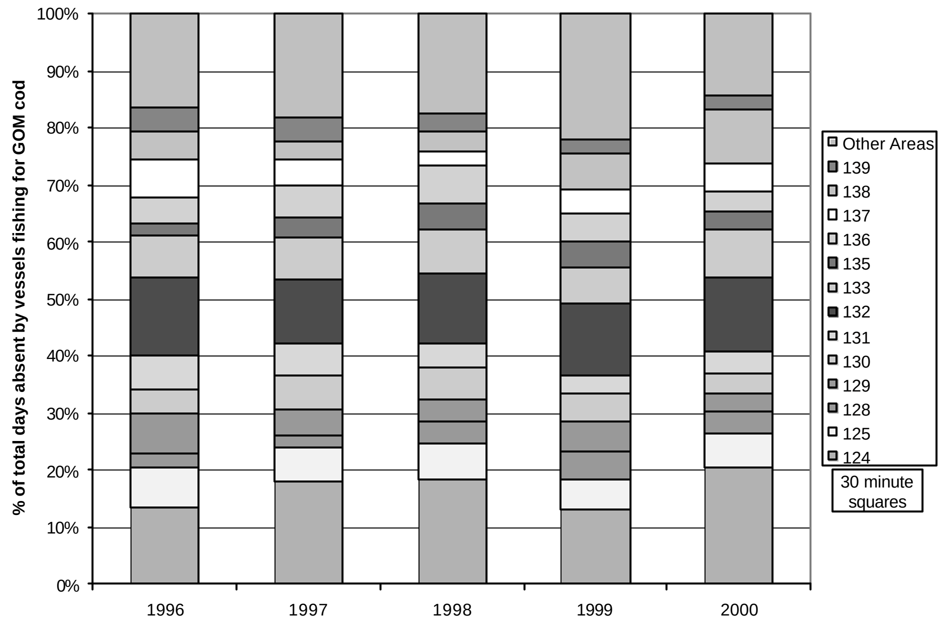


Figure 258 - Percentage of total days absent in the Gulf of Maine (by 30' squares), 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

As for the Gulf of Maine, fishing effort measured in percentage of days absent on Georges Bank mirrored effort measured in percentage of landings (Figure 259). The highest percentage of days absent occurred in block 98. A particularly striking feature of the data for Georges Bank is that percentages of days absent by vessels fishing for Georges Bank cod were very consistent from year to year, suggesting that fishing effort shifted very little on an annual basis in the years 1996 to 2000.

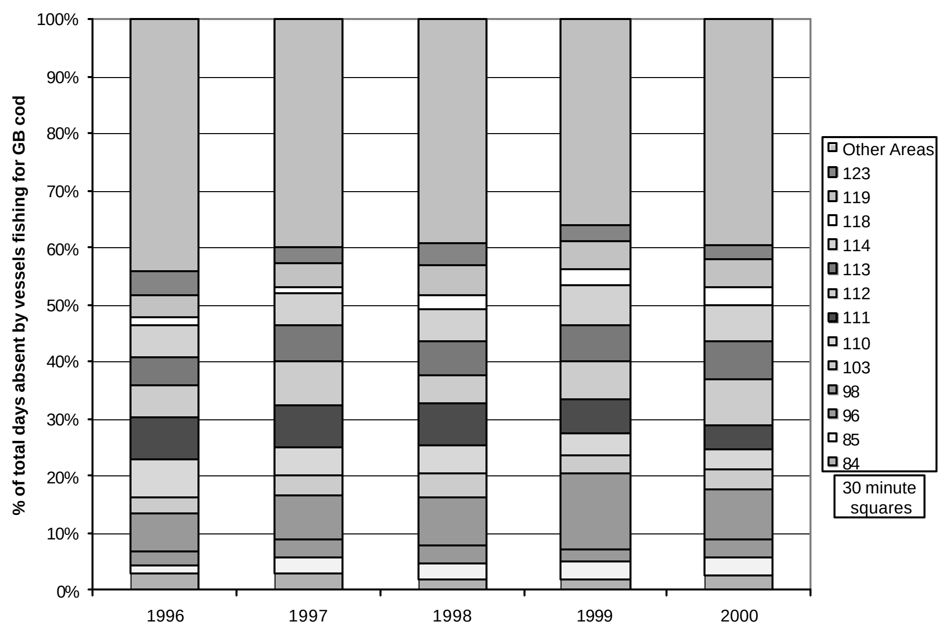


Figure 259 - Percentage of total days absent on Georges Bank (by 30' squares), 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

Seasonality
Temporal shifts in fishing effort were also examined. The percent of total days absent by vessels fishing for Georges Bank and Gulf of Maine cod is shown for each month from 1996 to 2000. The highest percentage of total cod landings in both the Gulf of Maine (5-20%) and Georges Bank (9-20%) occurred from April to June (Figure 260 and Figure 261). For both regions the peak month was May. It is likely that the beginning of the fishing year on May 1 initiates increased fishing effort as days-at-sea are renewed to the fleet. The percentage of total cod landings on Georges Bank declines more gradually between June and November than in the Gulf of Maine, where a sharp decrease in percentage of landings occurs from June to July. While the sharp decrease in percent of total Georges Bank cod landings in May 2000 may represent the effects of a new Georges Bank area closure in that year, it is likely a result of anomalous data. The highest percentage of days absent by vessels fishing for Georges Bank and Gulf of Maine cod also occurred from about April to June. Although a distinctly higher concentration of landings occurs during the late spring and early summer months, the percentage of days absent by both Georges Bank and Gulf of Maine vessels are distributed more evenly throughout the year.

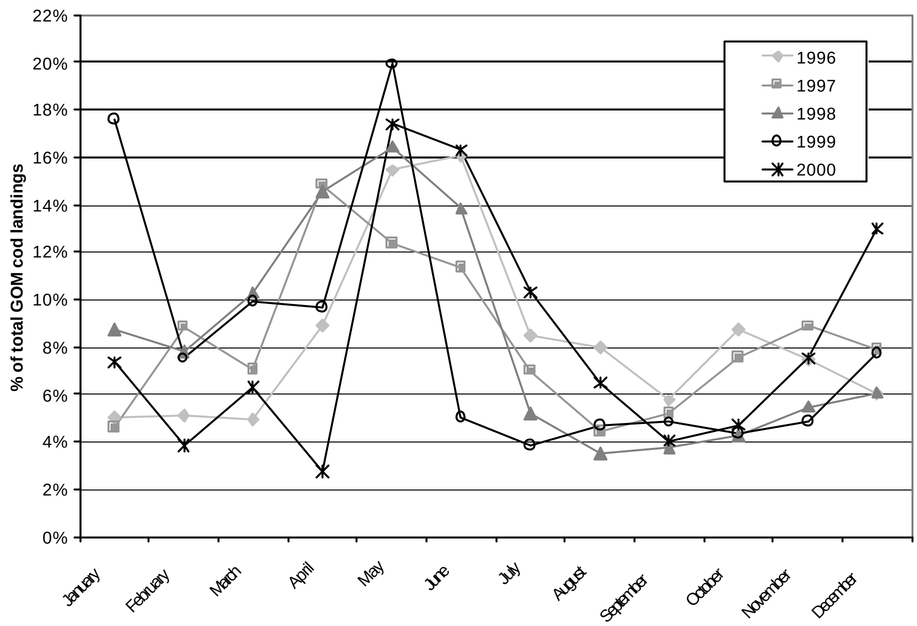


Figure 260 - Percent of total GOM cod landings by month, 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

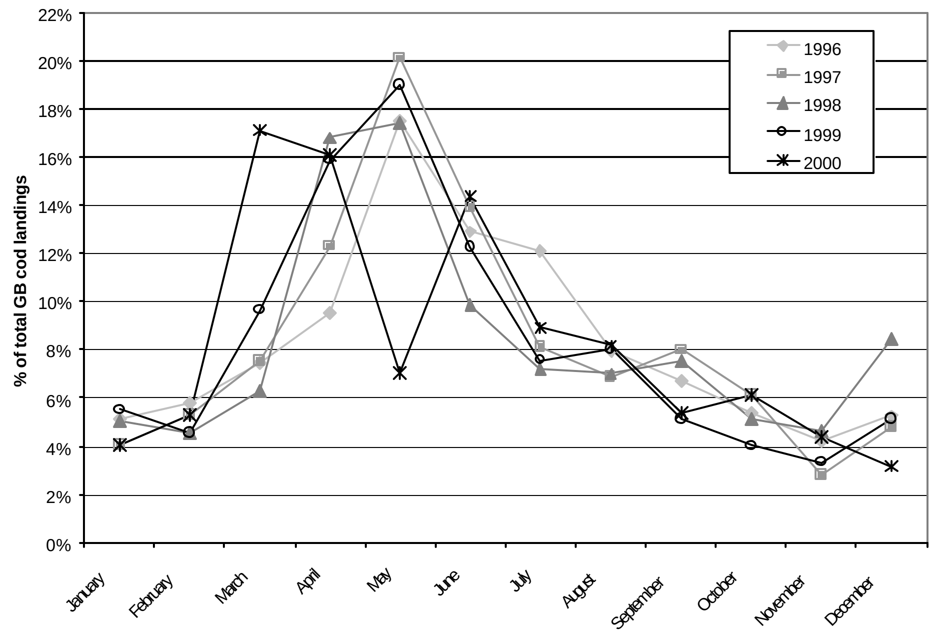


Figure 261 - Percent of total GB cod landings by month, 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

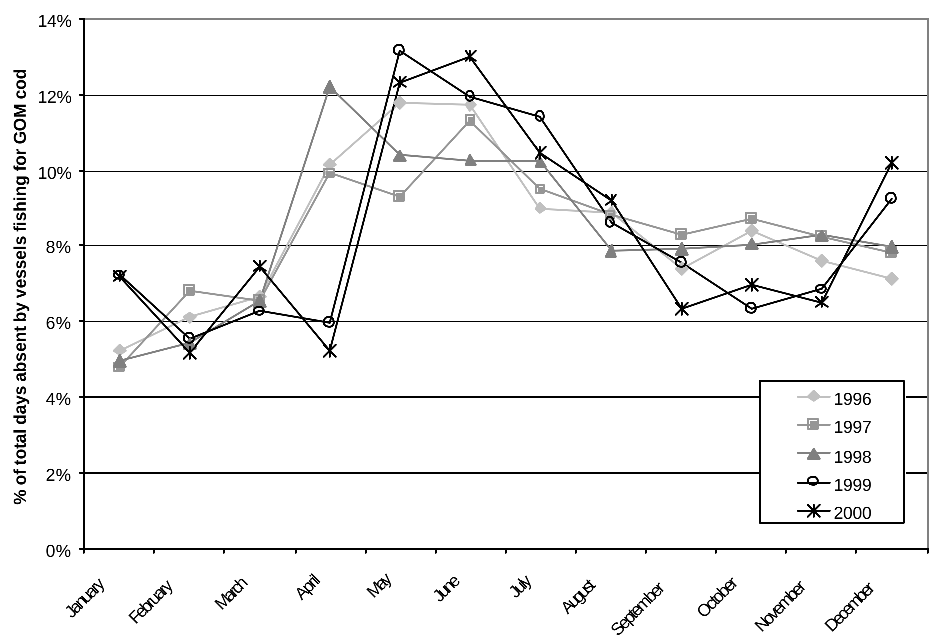


Figure 262 - Percent of total days absent by vessels fishing for GOM cod by month, 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

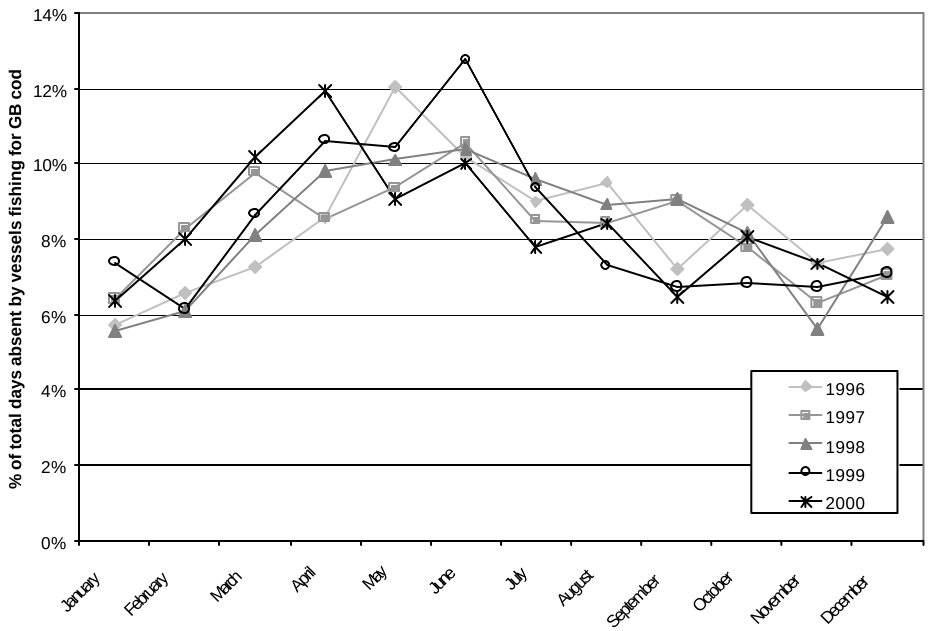


Figure 263 - Percent of total days absent by vessels fishing for GB cod by month, 1996-2000
Source Data: NMFS VTR database. Years denote calendar years.

9.4.2.7 Groundfish Vessel Safety

The United States Coast Guard's First Coast Guard District Office maintains an extensive database of fishing vessel safety incidents that occurred in the northwest Atlantic since January 1, 1993. Most of the information is for reportable casualties, defined as:

- A grounding;
- Loss of propulsion, primary steering or any associated control system that reduces the maneuverability of the vessel;
- An occurrence materially and adversely affecting the vessel's seaworthiness including but not limited to: fire, collision, sinking and flooding;
- A loss of life;
- An injury that requires professional medical treatment and that renders the individual unfit to perform his or her routine duties;
- An occurrence causing property damage in excess of $25,000.

In addition, the database includes information on Emergency Position Indicating Radio Beacon (EPIRB) alerts and trip terminations because of safety violations. The data for 1993 through 1999 are available to the public via a website (www.uscg.mil/d1/staff/m/fvs/statistics.html).

While the data are not organized by fishery, in many instances the type of vessel (scalloper, longline, gillnet, trawler, etc.) is recorded. Trawls, gillnets, and longlines are three of the primary gear types used to catch groundfish. While these gears are used in a variety of fisheries, examining the number of accidents on vessels using these gear types may give an indication of the number of accidents that occurred in the groundfish fishery.

Figure 264 shows the number of accidents for all fisheries since 1996, reported by groundfish fishing year. The number of equipment problems has declined annually since 1997 and sinking, taking on water, termination and EPIRB activation also generally decreased from 1997 to 2001. Fires increased from 1996 to 2000 and all other accidents varied without trend during these years. Figure 265 illustrates information on the same type of casualties, but only for incidents identified as being on trawl, gillnet, or longline vessels. The trends are similar to those for accidents in all fisheries. A proportionately greater increase in deaths occurred on trawl, gillnet or longline vessels than on all types of vessels between 1999 and 2000.

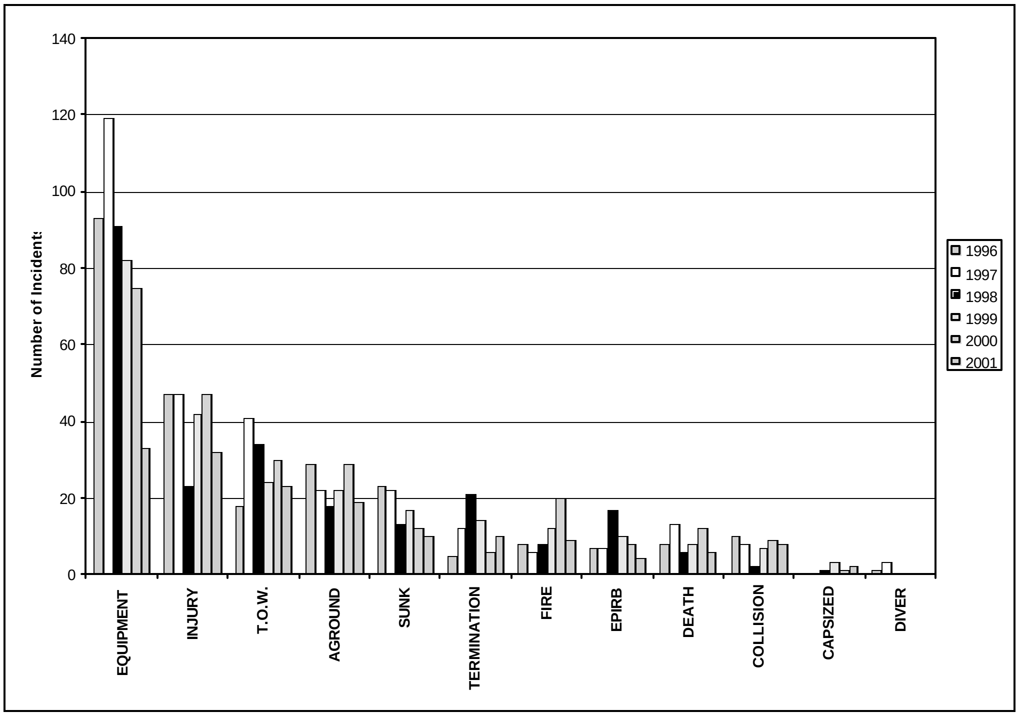


Figure 264 - Vessel safety incidents in all fisheries
*Source Data: USCG, unpublished data. *2001 data are current through 10/31/01*
All years denote fishing years – May 1 – April 30.

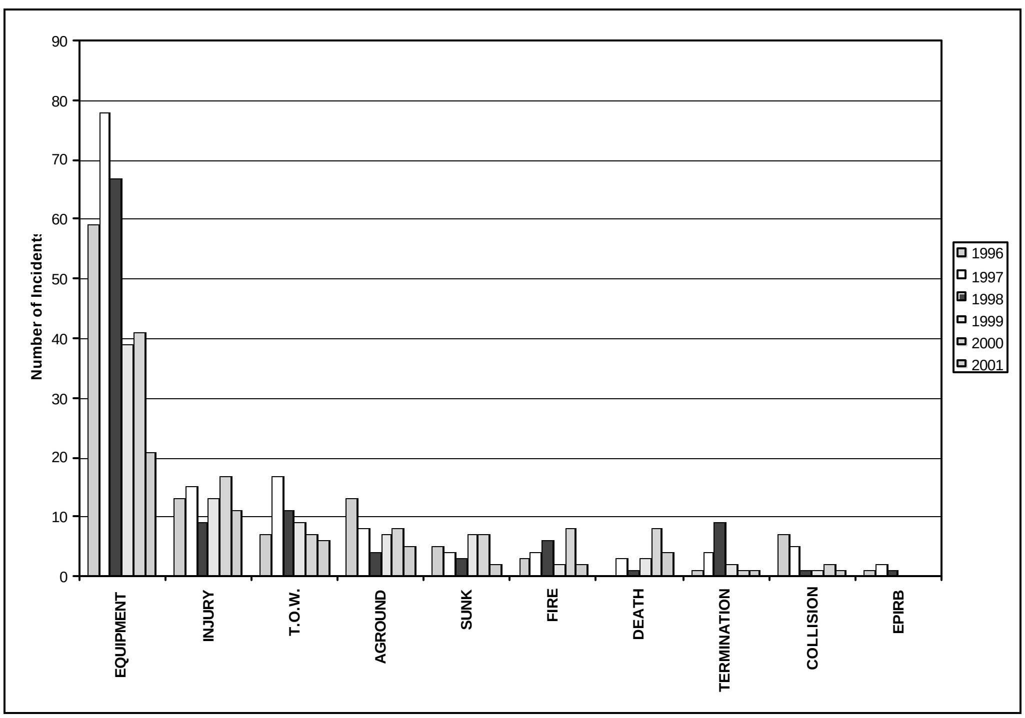


Figure 265 - Vessel safety incidents on trawl, gillnet, and longline vessels
*Source Data: USCG, unpublished data. *2001 data are current through 10/31/01*
All years denote fishing years – May 1 – April 30.

Figure 266 summarizes reported deaths or injuries for all fisheries. The number of injuries in all fisheries declined from high levels in 1996 and 1997 during following years. The number of deaths approximately doubled from fishing year 1999 to 2000, having remained fairly even prior to that point. As shown in Figure 267, the trends among trawl, gillnet and longline vessels were similar to those for all fisheries. However, where injuries increased among all vessels from 1998 to 1999, they decreased among trawl, gillnet and longline vessels during this same period. Deaths on these vessels show the same trends as in all fisheries. The number of deaths more than tripled from fishing year 1999 to 2000.

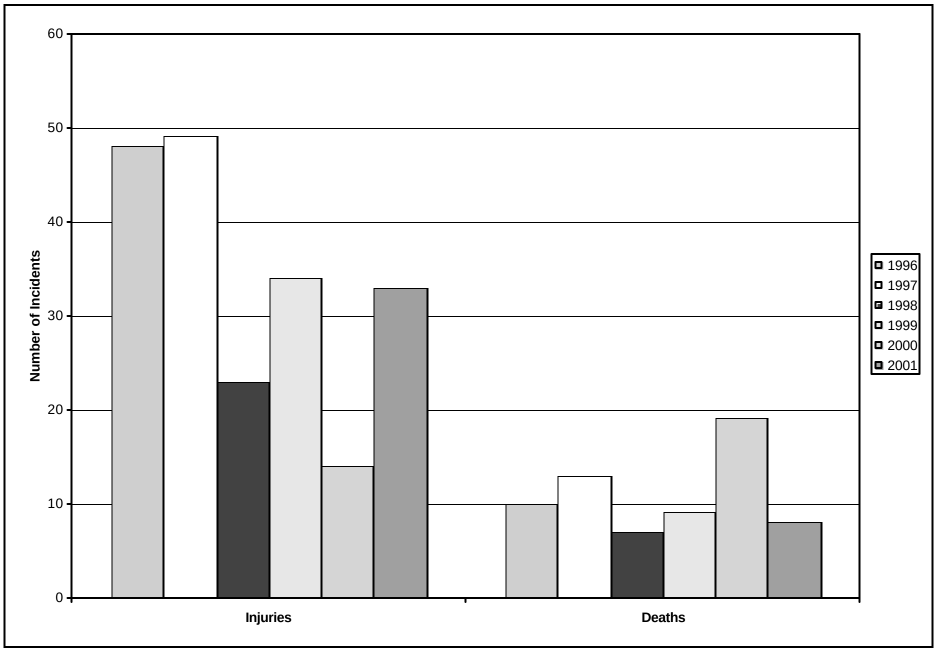


Figure 266 - Fishing vessel deaths and injuries in all fisheries
*Source Data: USCG, unpublished data. *2001 data are current through 10/31/01*
All years denote fishing years – May 1 – April 30.

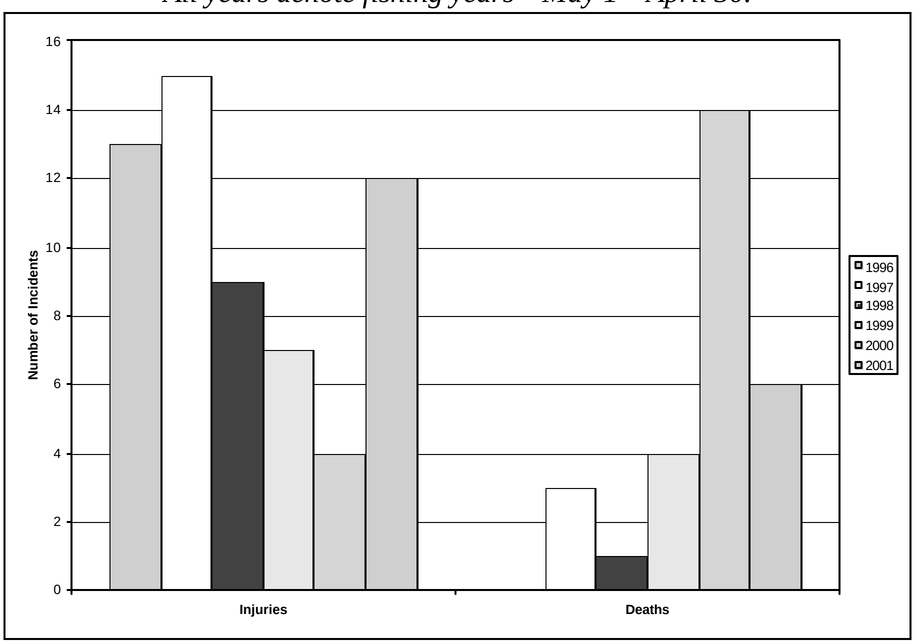


Figure 267 - Fishing vessel deaths and injuries on trawl, longline, and gillnet vessels
*Source Data: USCG, unpublished data. *2001 data are current through 10/31/01*
All years denote fishing years – May 1 – April 30.

The number of reported injuries and deaths on trawl, gillnet, and longline vessels was further examined by vessel length (Figure 268 and Figure 269). Injury information does not reflect any clear trend. The highest number of injuries within a vessel size class in any given year occurred in 1997, with 8 injuries on vessels between 50 and 75 feet in length. For all vessel sizes, the number of deaths increased in fishing year 2000. Twelve of thirteen deaths in 2000 occurred on vessels between 30 and 75 feet in length.

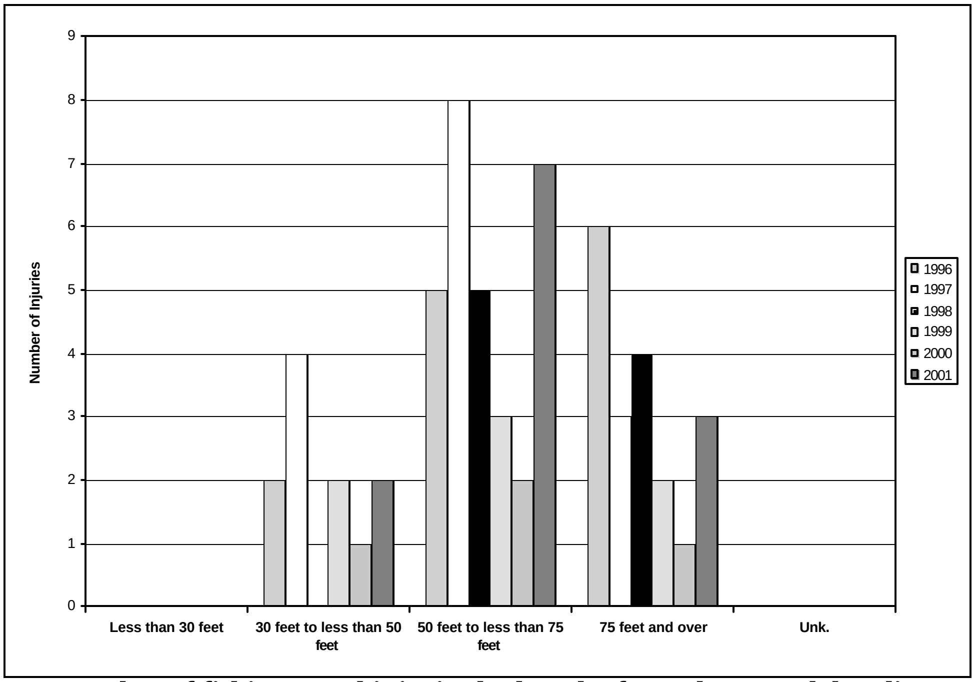


Figure 268 - Number of fishing vessel injuries by length of vessel on trawl, longline, and gillnet vessels

*Source Data: USCG, unpublished data. *2001 data are current through 10/31/01*
All years denote fishing years – May 1 – April 30.

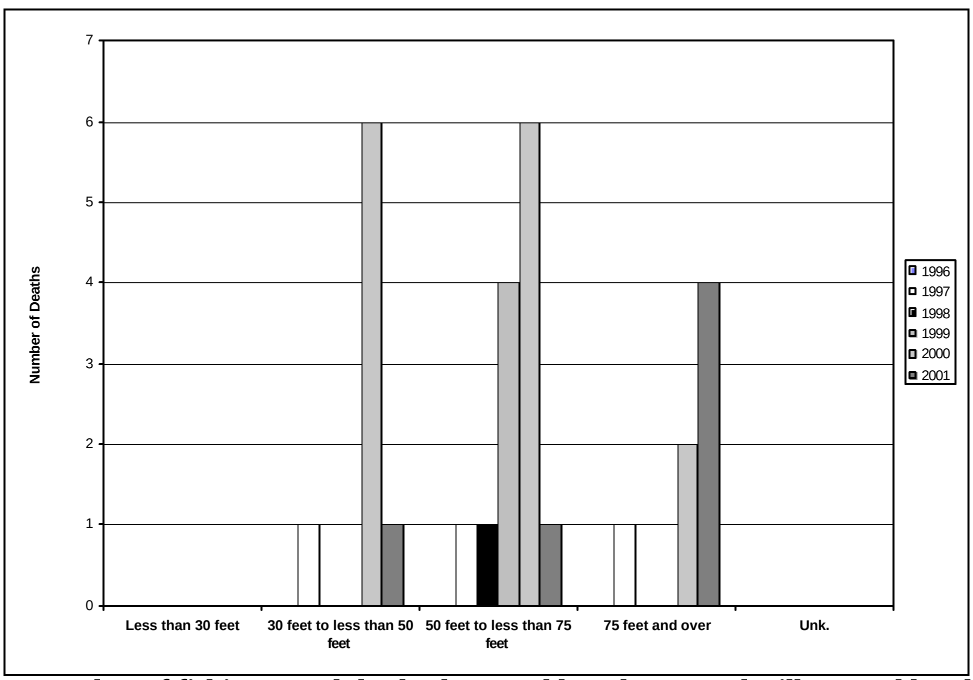


Figure 269 - Number of fishing vessel deaths, by vessel length on trawl, gillnet, and longline vessels

*Source Data: USCG, unpublished data. *2001 data are current through 10/31/01*
All years denote fishing years – May 1 – April 30.

It is difficult to draw conclusions on the impact of groundfish regulations on the safety record of the groundfish fleet absent a closer examination of individual vessel accident investigations. The data, with some exceptions, does not include information on the fishery that the vessel was participating in at the time of the accident. For example, trawl vessels are used in a variety of fisheries in New England, and it should not be concluded that all the accidents by these vessels occurred in the groundfish fishery. While examining the data allows a determination on the number of accidents that occurred, there is no simple way to determine if accident rates have increased or declined because the data cannot be directly compared to measures of fishing effort (such as days absent, DAS, pounds landed, revenue, etc.). Some general statements, however, can be made:

- The number of deaths on trawl, gillnet and longline vessels has increased, though it is unknown in which fisheries the deaths occurred.
- The number of injuries on trawl, gillnet and longline vessels decreased marginally between 1996 and 2000. Injuries increased in 2001.

9.4.2.8 Bycatch

The M-S Act defines bycatch as fish which are harvested in a fishery, but which are not sold or kept for personal use, including economic discards and regulatory discards. Fish released alive under a recreational catch and release fishery management program are not included. Further, the M-S Act requires that, to the extent practicable, bycatch should be minimized and the mortality of bycatch that cannot be avoided should be minimized. In order to consider whether these objectives are being met, bycatch must be reported and assessed. To this end, the M-S Act requires that a standardized reporting methodology assess the amount and type of bycatch occurring in a fishery. The primary tools used to report bycatch in the multispecies fishery are the Vessel Trip Report system (VTR) and the seas sampling/observer program. Each permitted vessel is required to report catch and landings in VTRs submitted on a periodic basis. The seas sampling/observer program places personnel on boats to observe and estimate the amount of discards on a haul-by-haul basis. A federal judge recently ruled that the NMFS acted arbitrarily, capriciously, and contrary to law when it did not adopt new measures to report and assess bycatch after passage of the Sustainable Fisheries Act (*Conservation Law Foundation et al. v. Donald Evans*) in 1996.

The amount of bycatch in Northeast Region fisheries is routinely estimated on a stock-by stock and calendar year basis in the assessments conducted as part of the stock assessment workshops (SAW) reviewed by the stock assessment review committee (SARC). Generally, the estimates of discards can be divided into three broad categories: stocks for which no estimates are possible, stocks for which estimates are possible but are not included in the catch-at-age matrix (for a variety of reasons), and stocks for which estimates are available and are included in the catch-at-age matrix. These broad categories are not unchanging, in that the precisions of discard estimates for any given stock may change over time. This can be due to many reasons, such as changes in sampling, in the level of observer coverage, or in the level or quality of reporting through VTRs.

Most discard estimates are categorized according to gear, as opposed to other criteria such as target species. There are exceptions to this general rule, however, as estimates are generated for specific small mesh fisheries (shrimp and whiting are the two primary examples). Estimates for recreational fisheries are also included in assessments for some stocks. Information on discard mortality varies on a stock-to stock basis. For most stocks managed in the multispecies fishery, reliable estimates of discard mortality are not available and the assumption used in the assessment is that all discards are dead.

While the primary sources of data for commercial fishery discard estimates are VTRs and the sea sampling/observer program, a variety of statistical methods convert the information from these systems into discard estimates. In addition, some discard estimates are generated through a statistical examination of survey data, fishing effort, and fishery selectivity patterns. These methods are described in detail in the pertinent assessment documents and various technical memoranda.

There are nineteen groundfish stocks identified as regulated groundfish managed through this action. Commercial discard estimates are available for eleven of these stocks from their most recent assessments. For some stocks, discard estimates are available for over thirty years. The summary below, however, focuses on the five to seven year period prior to adoption of Amendment 5 in 1994 and the discard estimates since that period. As suggested earlier, the precision of the estimates varies from stock to stock, as does the level of detail. For some stocks, discard estimates are available by gear and age, while for others only total commercial discards are presented in the SAW documents. Recreational estimates of discards are included in the assessments of only three stocks, and are based on Marine Recreational Fishery Statistical Sampling (MRFSS) data. While MRFSS may allow calculation of discards for other stocks, only those stocks where the information was included in the SAW are presented in this summary. The most recent estimate of discards is summarized in Table 517 and described further below. Discard estimates are also available for other species caught in the groundfish fishery. These estimates are summarized in a following section.

Stock	Most Recent Estimates (mt except for Rec.)								Source
	Otter Trawl	**Gillnet**	**Shrimp Trawl/ Small Mesh**	**Longline**	**Scallop Dredge**	**Rec. (number)**	**Landings (U.S.)**	**Year**	
GOM Cod	828	663				724,000	4,416	2001	Comm.: GARM – 2002 Rec.: SAW – 34 (2000)
GB Cod	*199*	*56*					*10,635*	*2001*	*GARM - 2002*
GB Haddock									TRAC 2001; insignificant discards
GOM Haddock	*								SAW – 34 estimated discard rates
GB Yellowtail	44				461		3,800	2001	GARM - 2002
CC/GOM Yellowtail	446	3	4		30		2,505	2001	SAW - 36
SNE/MA Yellowtail							1,000	2001	SAW – 36: 66 mt commercial discards
GOM Winter	8	4	3			98,000	571	2001	SAW - 36
GB Winter	*27*						*1,677*	*2000*	*SAW – 34; discard estimates unreliable*
SNE/MA Winter						81,000	4,448	2001	SAW – 36; 83 mt commercial discards
Plaice	496		27				4,479	2001	GARM - 2002
Pollock									
Redfish									
White Hake	*374*	*65*					*3,482*	*2001*	*GARM - 2002*
Witch Flounder	278		0.84				3,186	2002	SAW – 37
Windowpane (north)									
Windowpane (south)									
Ocean Pout									
Halibut									

Table 517 – Summary of recent bycatch estimates of groundfish species
Entries in italics not used in catch at age matrix for the assessment.

9.4.2.8.1 Stocks Without Discard Estimates

Recent discard estimates (since 1994) are not available for halibut, pollock, redfish, windowpane flounder (both stocks), and ocean pout.

9.4.2.8.2 Discard Estimates Not Used in Catch-at-Age Matrix

Discard estimates are available for GB cod, GB winter flounder, white hake, and GOM haddock. These estimates are of varying reliability and were not used in catch-at-age matrices for a variety of reasons. The most current estimates are summarized below.

9.4.2.8.2.1 GB Cod

Preliminary estimates for 1989-2001 were derived from the Sea Sampling database (GARM 2002). Discard ratios were estimated for eastern and western Georges Bank, with less discarding occurring in the eastern part. Estimates were also developed using the VTR database for 1994-2001. Discarding apparently increased in 1999 (based on the VTRs), possibly due to the adoption of a trip limit, but was still at low levels relative to landings (250 mt in 2001). Discard estimates were not used in the assessment due primarily to the lack of data for 1978-1988. In addition, the sea sampling data for 1989-2000 are limited by inadequate trip coverage and few biological samples.

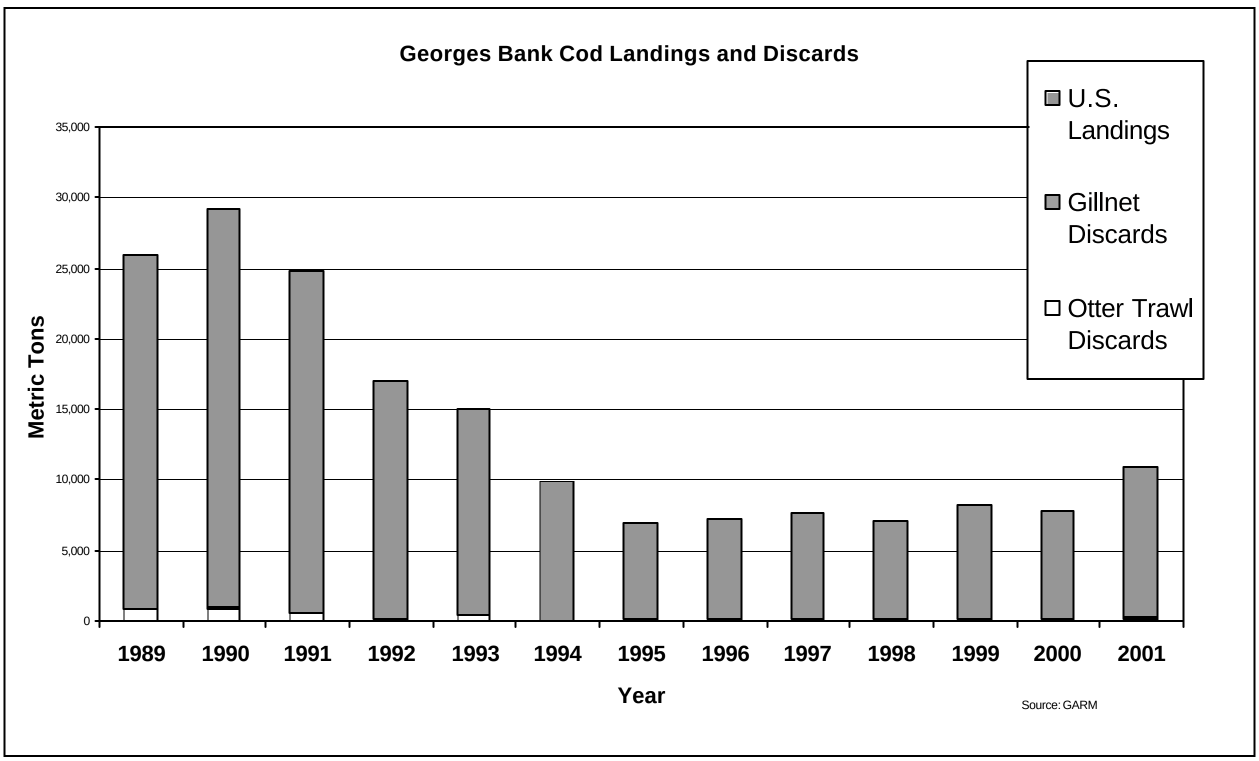


Figure 270 - Georges Bank cod landings and discards, by gear (GARM 2002)

9.4.2.8.2.2 GB Winter Flounder

Sea sampling data for 1989-2000 represent the most reliable source of information available for commercial discards. The total number of otter trawl trips sampled ranged from 3 to 17 trips annually and produced discard estimates ranging from 1.2 to 24.9 mt, less than 2 percent of the otter trawl landings.

Scallop dredge trips were more limited, ranging from 3 to 17 trips annually, and prevented even preliminary estimates. Two other approaches to estimating discards were also examined. VTR-based estimates ranged from 7 to 22 mt, or up to 3 percent of the otter trawl landings. A third approach attempted in 1999 used a combination of commercial sea sampling data and research vessel survey cruises to estimate the total number discarded at length. In summary, data from all three approaches were considered insufficient to reliably estimate the magnitude or age composition of winter flounder discards occurring in the otter trawl and scallop dredge fisheries on Georges Bank. The results, however, consistently produced low estimates of discards to landings through the entire time period. Estimates based on sea sampling data and discard ratios are shown below (SAW 34).

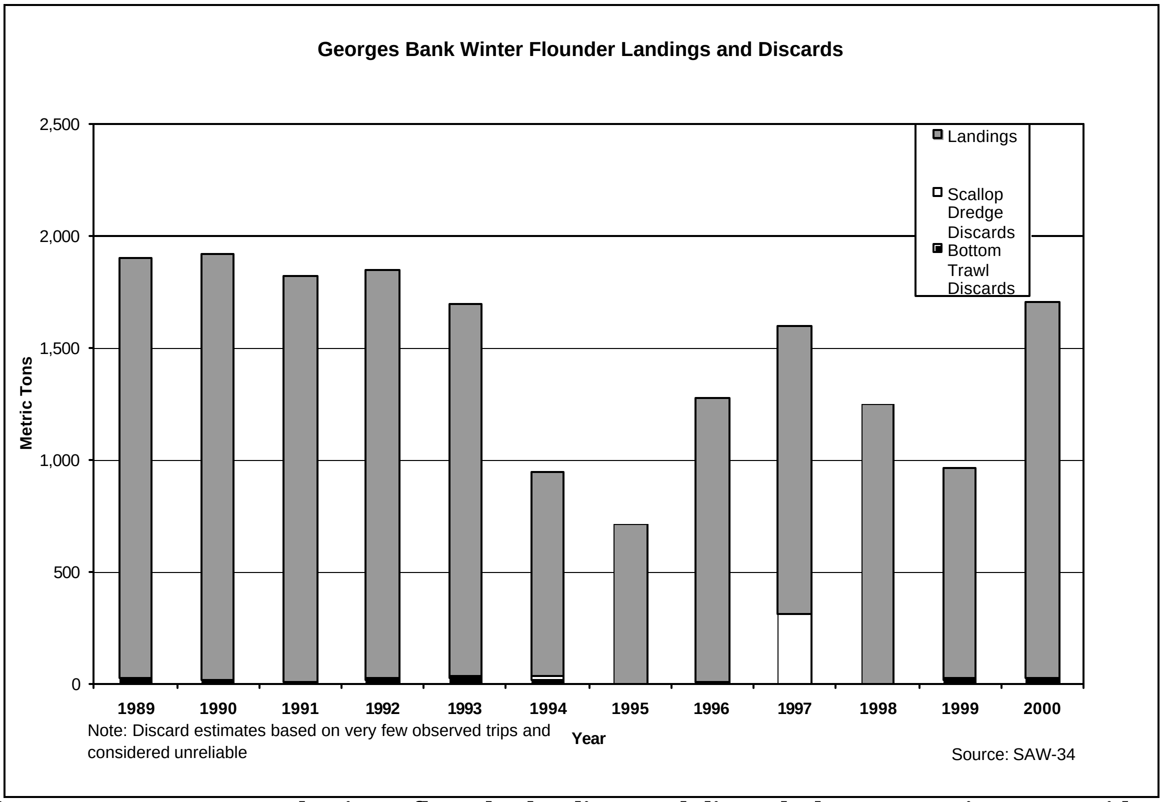


Figure 271 - Georges Bank winter flounder landings and discards, by gear. Estimates considered unreliable due to low number of observed trips (SAW 34)

9.4.2.8.2.3 White Hake

Estimates of total discards were calculated for three gear types based on data in the Domestic Sea Sampling Program. Discard rates were calculated based on the total pounds discarded/total pounds kept for each gear and semi-annual periods. To estimate discards prior to 1989, an average proportion for 1989-2000 was applied to the landings from 1964 – 1988. Estimates ranged from less than 200 mt in 1995 to more than 4000 mt in 1990. Discards appear to increase in years when there was a dominant year class. Discards at age were also estimated but were not used in the assessment as the VPA was rejected by the SARC (SAW 33).

Most discards occurred in the large mesh otter trawl fishery. In most years, discards appear to be primarily one or two year old fish. In the years of high discards that correspond with a dominant year class, some three and four year old fish are also discarded.

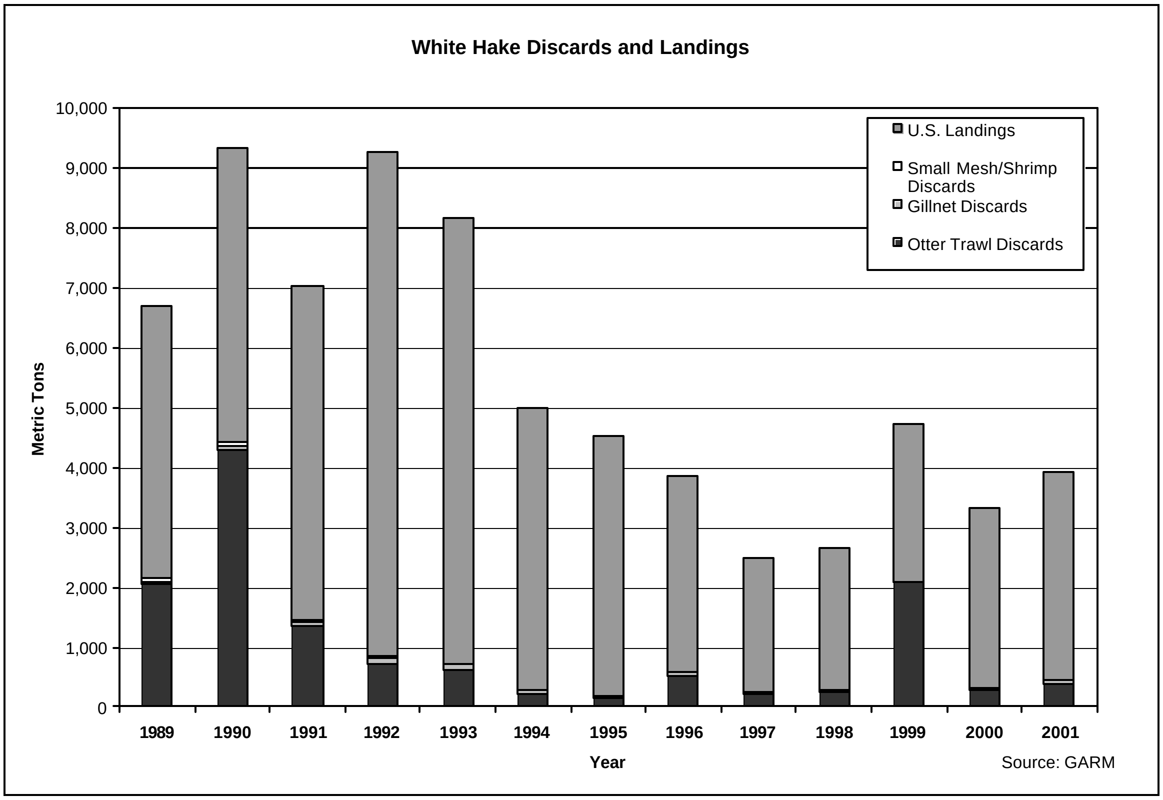


Figure 272 - White hake discards by gear and landings (metric tons) (GARM 2002)

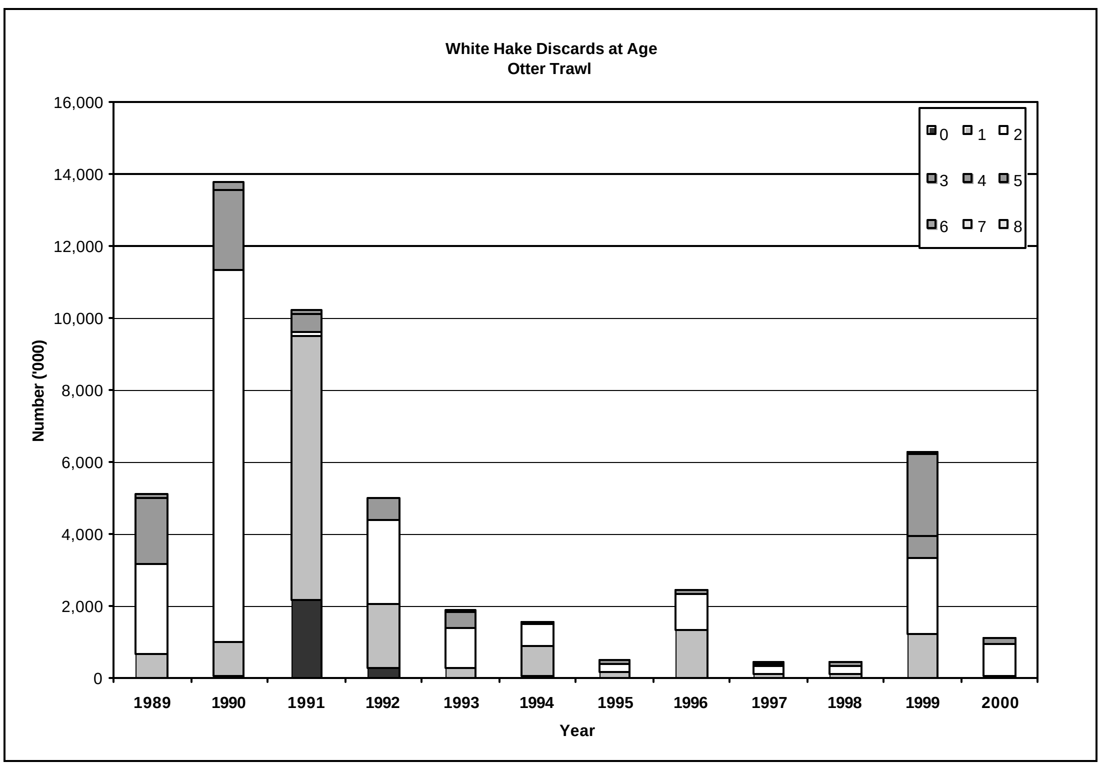


Figure 273 - White hake discards at age, numbers (‘000) of fish. (SAW 33)

9.4.2.8.2.4 GOM Haddock

The ratio of haddock discarded to haddock kept in observed sea sampling trips was calculated for otter trawl, gillnet, and longline gear in SAW-32. These ratios were not expanded to an estimate of overall discards because of few observed trips.

9.4.2.8.3 Discard estimates used in catch–at–age matrix

If there is sufficient confidence in discard estimates, and they reflect a significant amount of the total removals from a stock, the discard estimates are included in the catch used for an age-based assessment. Recent assessments for GOM cod, GB yellowtail flounder, SNE/MA yellowtail flounder, SNE/MA winter flounder, plaice, CC/GOM yellowtail flounder, GOM winter flounder, and witch flounder, included discard estimates in the catch.

9.4.2.8.3.1 GOM Cod

Prior to 2001, discard rates were routinely estimated based on the sea sampling database since 1989. Rates were calculated by quarter and gear. The problem of estimating cod discards was exacerbated by low trip limits (at one point, 30 pounds) in 1999 that resulted in additional discards, and a low number of observed trips in some quarters in both 1999 and 2000. In the last assessment for GOM cod, discard estimates were calculated in three different ways. First, rates were based on the sea sampling database. Second, a subset of available VTRs was used to estimate discards on a monthly basis. Third, a predictive economic model estimated discards in 1999 and 2000. There was no objective basis to select one method over another. The estimates of discards from all three approaches were reasonably close to each other, ranging from 2,600 mt – 3,500 mt in 1999 and 1,200 – 3,100 mt in 2000. The assessment added 2,500 mt to reported landings in 1999 and 1,000 mt to reported landings in 2000. GARM 2002 added 1,500 mt to landings in 2001. For recreational vessels, discards (numbers of fish) were estimated through the MRFSS database (SAW 33). Estimates for 2001 were developed in the GARM (2002) using similar methods.

Commercial discards of GOM cod were at very low levels from 1994 through 1998, then increased dramatically with the imposition of restrictive trip limits. Discards continue to increase, probably because the stock is rebuilding and the trip limits have not been adjusted accordingly. Recreational discards are roughly equal to recreational harvest since 1989.

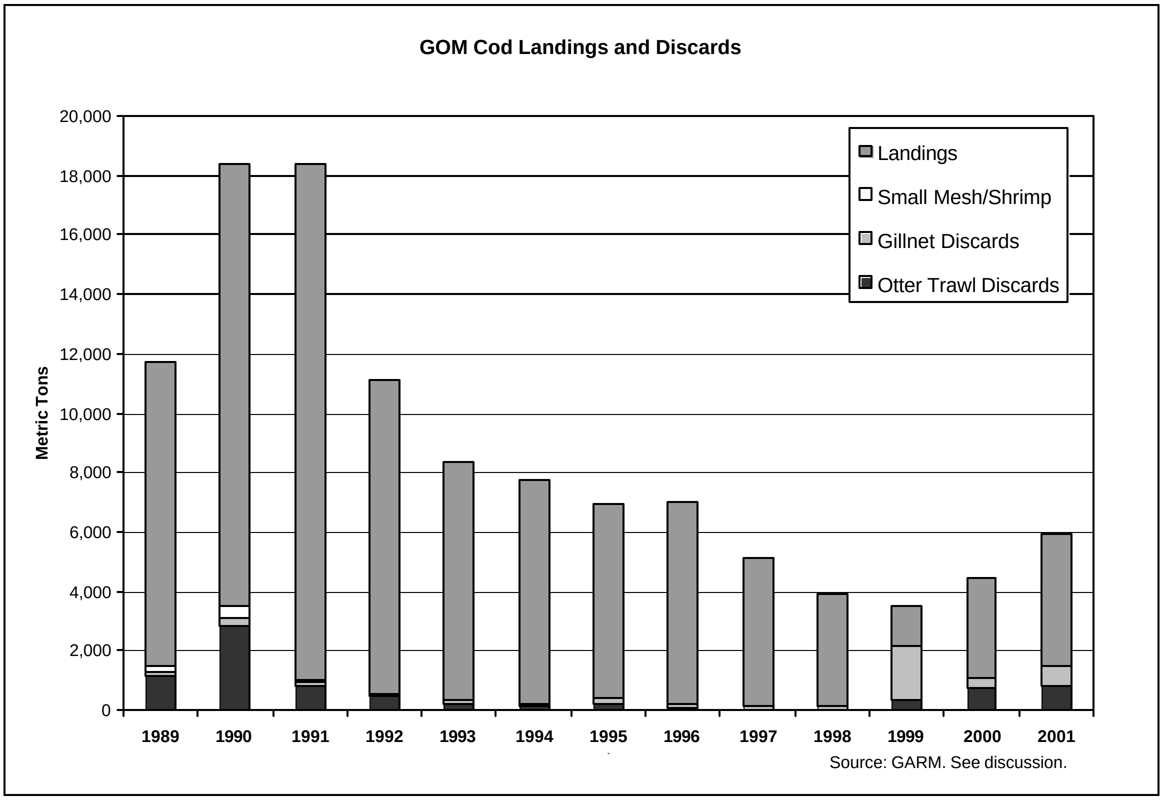


Figure 274 - GOM cod commercial landings and discards. Estimates shown based on sea sampling data, see text for additional discussion. (GARM 2002)

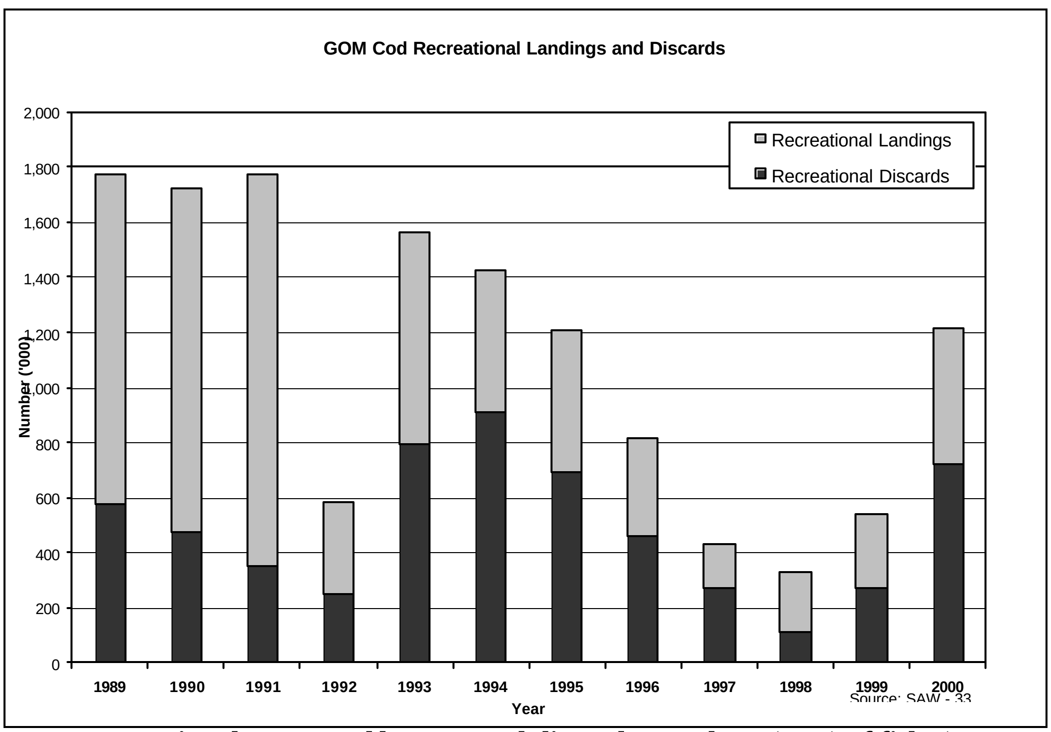


Figure 275 - Recreational GOM cod harvest and discards, numbers ('000) of fish. (MRFSS, SAW 33)

9.4.2.8.3.2 GB Haddock

Georges Bank haddock discards have been estimated periodically and added to the catch when discard levels were significant. The most recent assessment (TRAC 2001) estimated regulatory discards resulting from trip limits during 1994-1998. Discards were assumed low and not estimated for 1999 through 2001 (GARM 2002). With the increase of trip limits as GB haddock has rebuilt and the adoption of large mesh in 1996, discards have declined to an insignificant level for this stock.

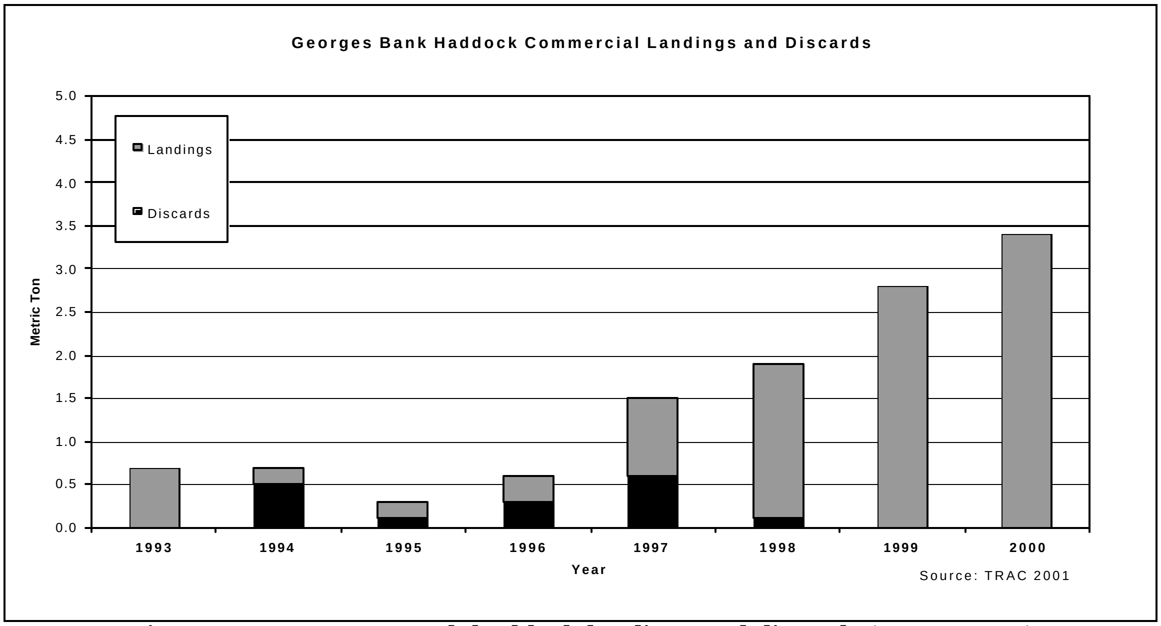


Figure 276 - Georges Bank haddock landings and discards (TRAC 2001)

9.4.2.8.3.3 Georges Bank Yellowtail Flounder

GB yellowtail flounder discard estimates were based on sea sampling data for otter trawl and sea scallop gear. Discarding of small ye llowtail flounder has been an important source of mortality due to fishing pressure, discrepancies between minimum size limits and gear selectivity, and trip limits imposed on the scallop fishery. Scallop discards in 2001 are estimated at 301 mt, while otter trawl discards are estimated at 57 mt (TRAC 2001). Discards declined significantly in 1994, probably due to declines in stock size and reduced fishing effort as a result of management restrictions, and improved gear selectivity because of mesh size increases. Discards in recent years have increased as the stock size and landings increased, but have not returned to the levels observed before 1994. While age 1 fish were a significant part of discards prior to 1994, since 1994 their presence in discards has been negligible. The majority of discards occurred in the scallop fishery in 2000 and 2001.

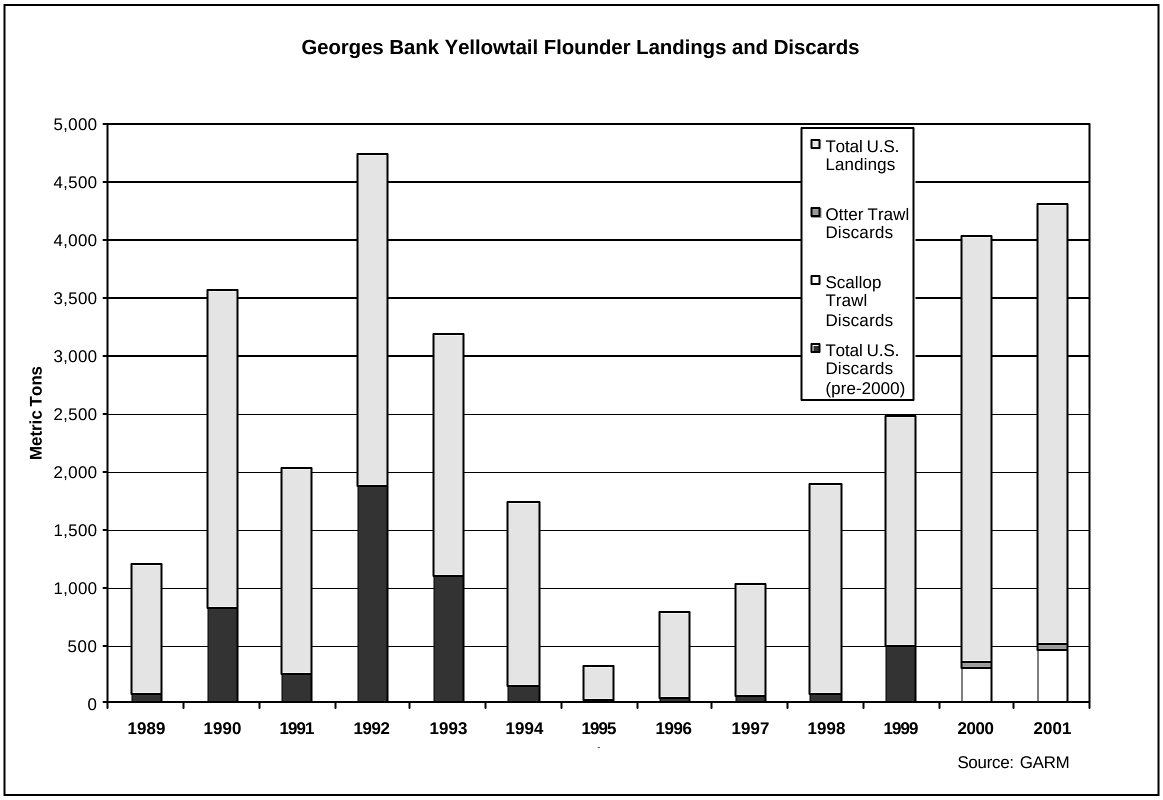


Figure 277 - GB yellowtail flounder landings and discards, all gear, metric tons. (GARM 2002)

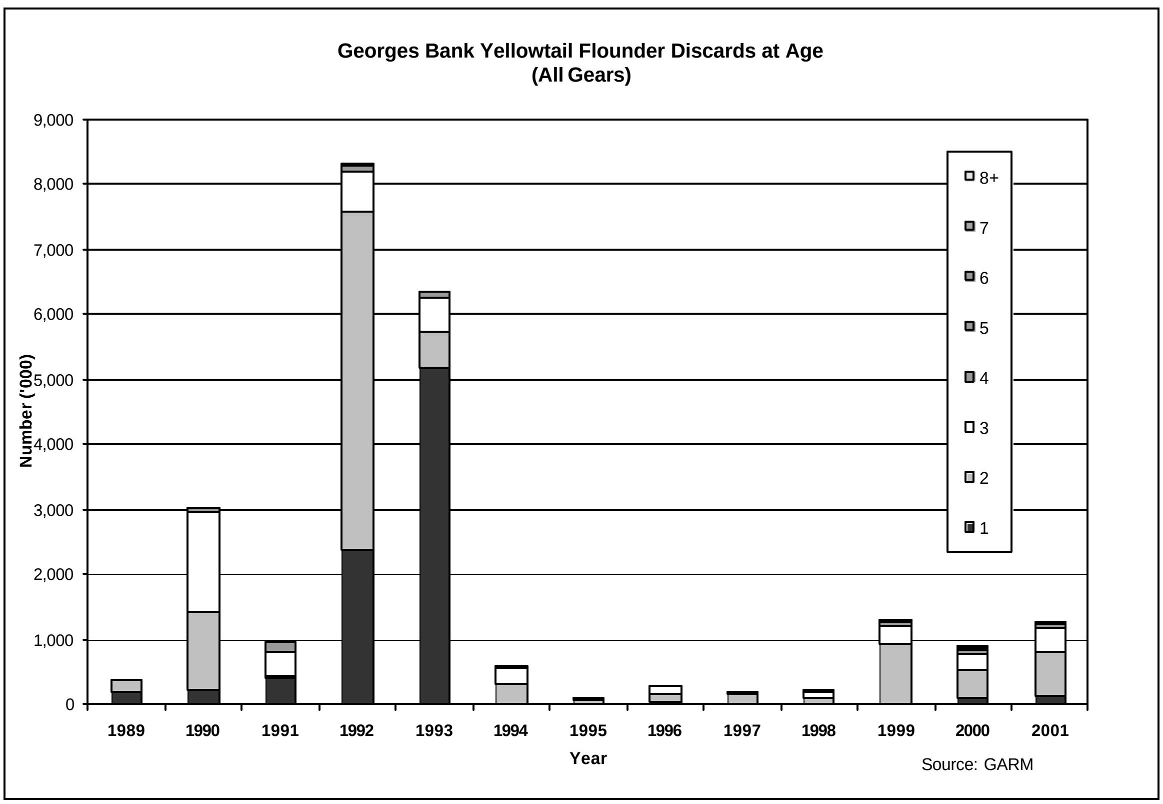


Figure 278 - GB yellowtail flounder discards at age, numbers ('000) of fish. (GARM 2002)

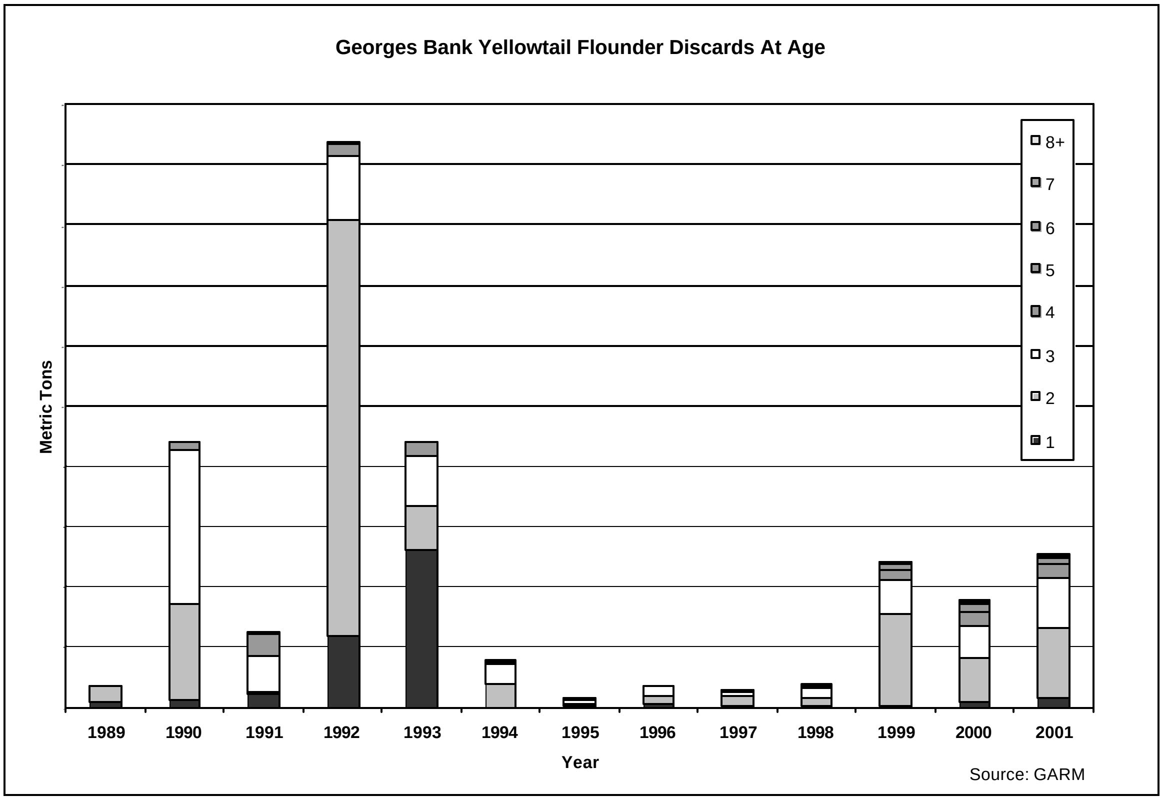


Figure 279 - GB yellowtail flounder discards at age, metric tons. (GARM 2002)

9.4.2.8.3.4 SNE/MA Winter Flounder

Commercial fishery discard estimates have been calculated using a variety of statistical techniques. Discards for 1985 through 1993 were estimated using a combination of survey, commercial port sampling, and mesh selectivity information (SAW 21). For later years, this method, sea sampling data, and VTRs were examined, and VTRs were determined to provide the most reliable data. The number of fish discarded at length was multiplied by 50 percent in both methods to represent the assumed mortality rate. Recreational discards assume a 15 percent mortality rate. Recreational estimates are based on the MRFSS data (SAW 36).

Commercial discards declined from 1989 through 1995, then increased slightly in 1998 as the commercial catch increased, but declined since 1999, probably due to mesh increases. Discards are primarily fish age 3 or younger. Recreational discards have been at low levels since 1989.

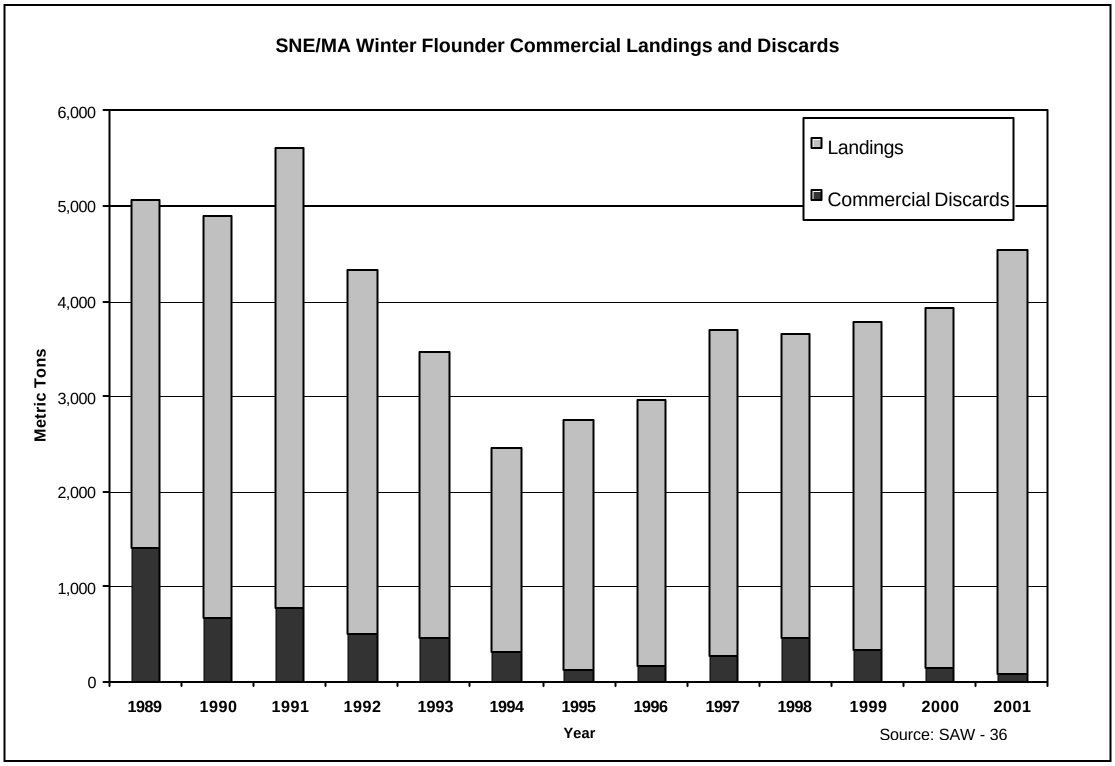


Figure 280 - SNE/MA winter flounder commercial landings and discards (SAW 36)

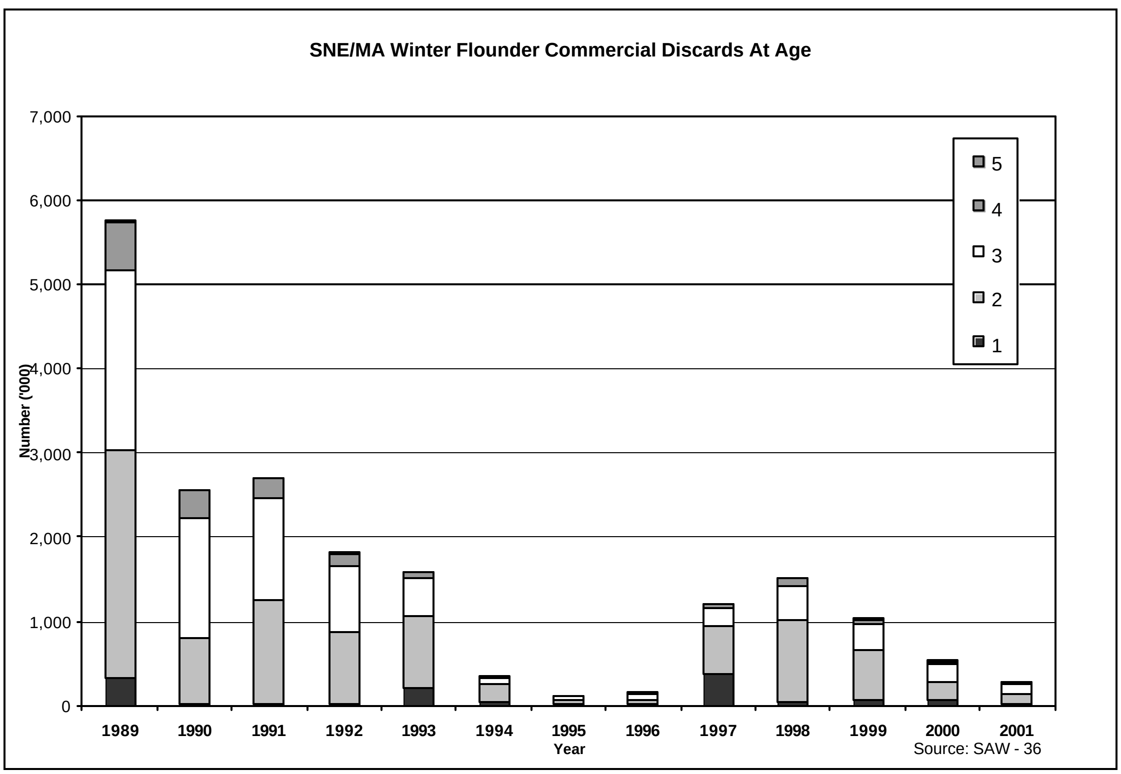


Figure 281 - SNE/MA winter flounder commercial discards at age, numbers ('000) of fish. (SAW 36)

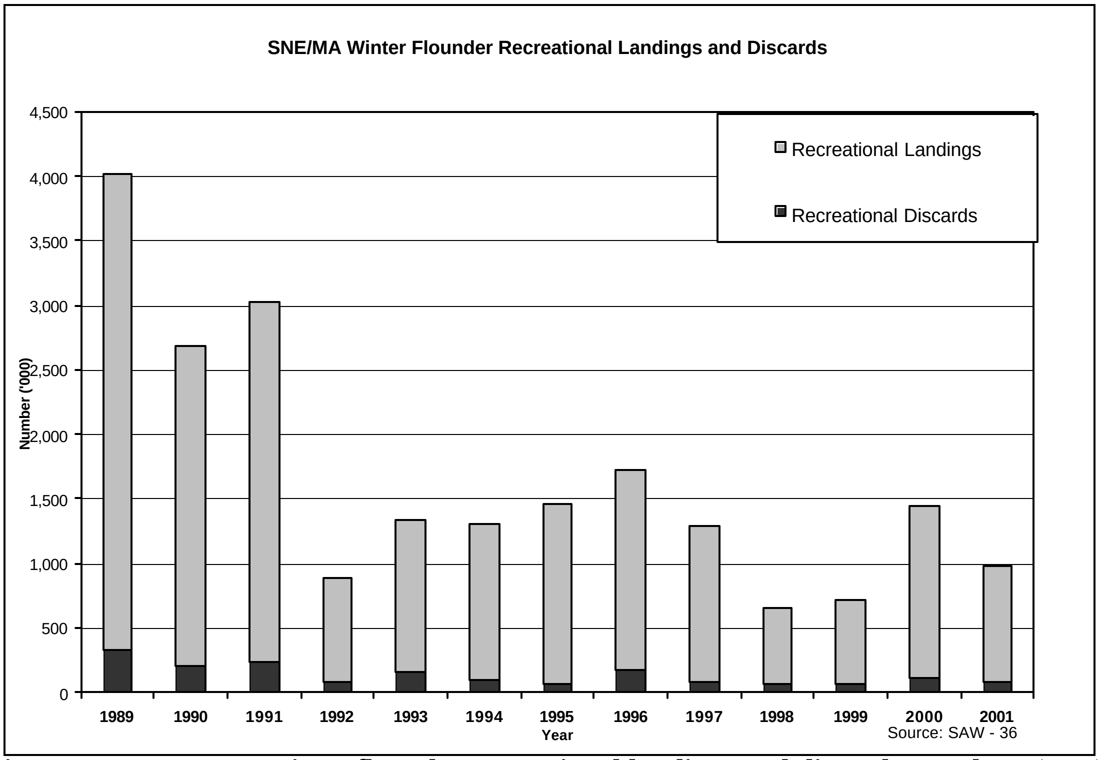


Figure 282 - SNE/MA winter flounder recreational landings and discards, numbers ('000) of fish. (SAW 36)

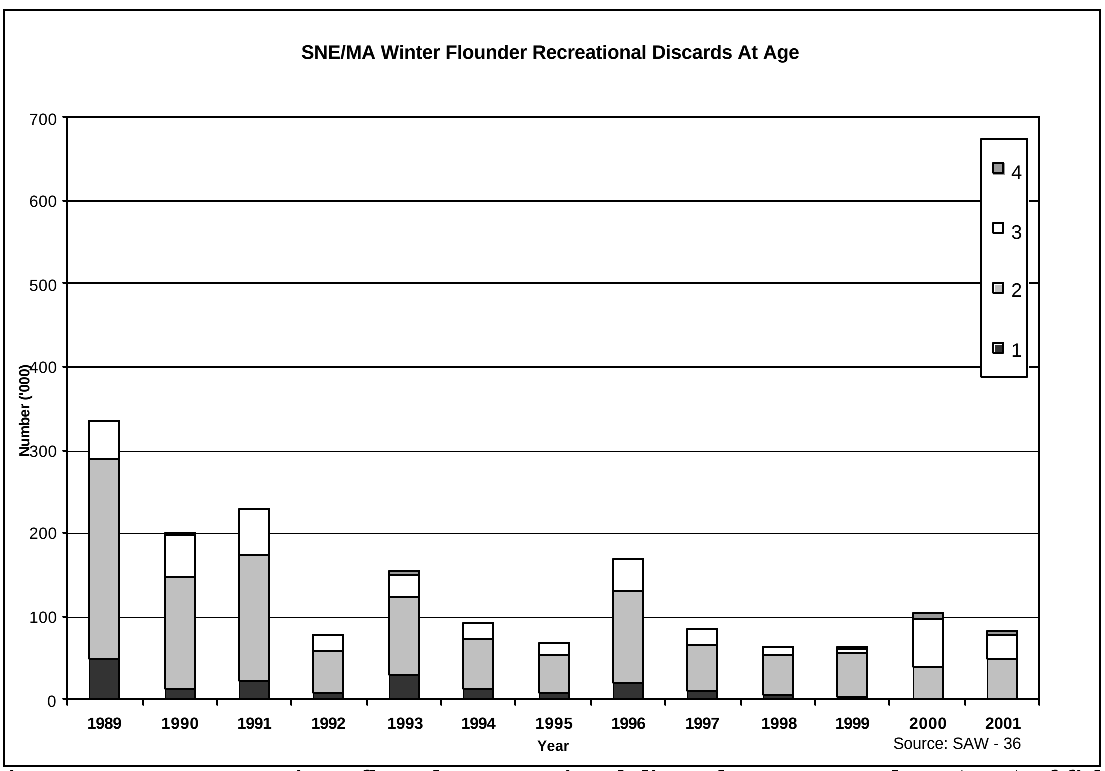


Figure 283 - SNE/MA winter flounder recreational discards at age, numbers ('000) of fish. (SAW 36)

9.4.2.8.3.5 American Plaice

Commercial fishery discards were estimated for the large mesh otter trawl fishery and the northern shrimp fishery. For the shrimp fishery, an indirect method was used for the period s 1980 – 1988 and 1998 – 1999, while a direct method estimating discards per trip from the sea sampling database was used for 1989 – 1997. A survey method was used for the large mesh otter trawl fishery. A method for the small mesh fisheries has not been developed (SAW 32).

Plaice discards declined significantly between 1995 and 1996, likely due to mesh increases and reductions in fishing effort. Since then, discards have remained steady in spite of fluctuations in landings. In the otter trawl fishery, discards are primarily fish age 4 or older. Prior to 1995, however, age 2 and 3 fish were a noticeable component of otter trawl discards, but mesh increases in 1994 and 1996 have almost eliminated discards of these young fish. In the northern shrimp fishery, discards of age 4 and older fish declined with the imposition of the nordmore grate. Most discards are now age 2 and younger. Discards in the shrimp fishery are at low levels in the latest years of the series, due to use of the nordmore grate and reduced effort in the fishery.

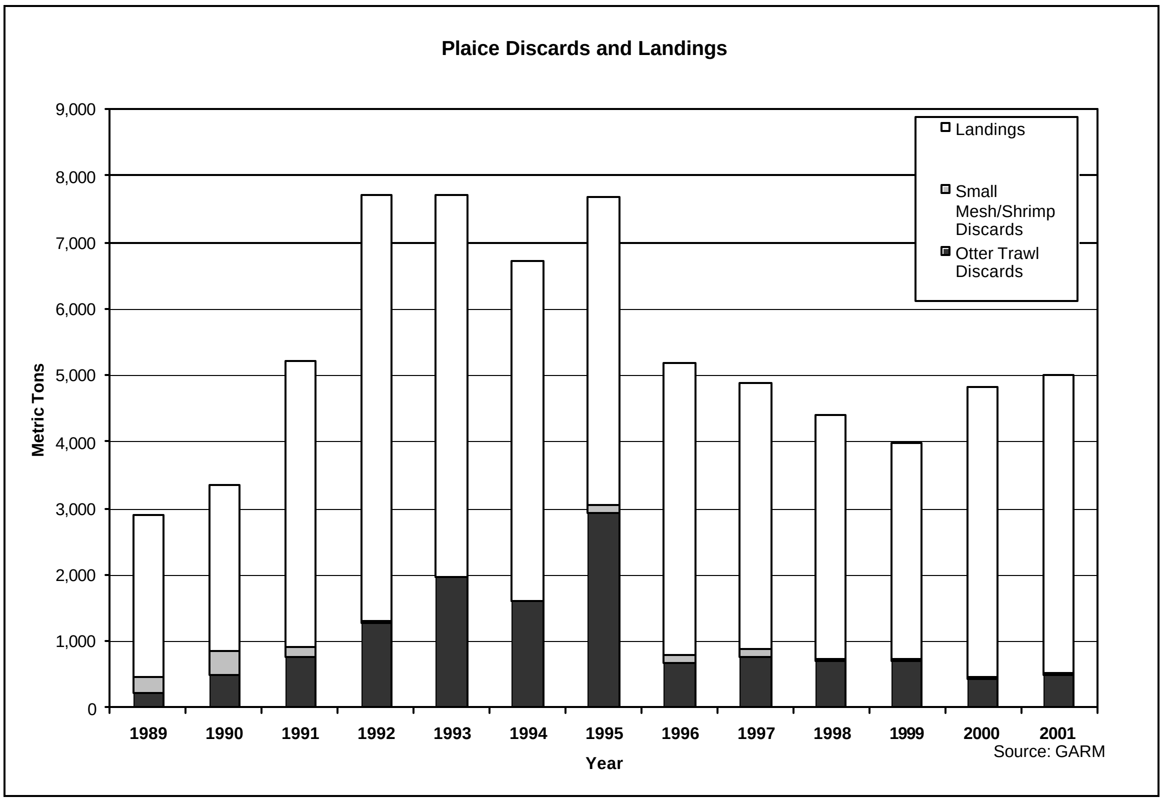


Figure 284 - American plaice discards by gear and landings, metric tons. (GARM 2002)

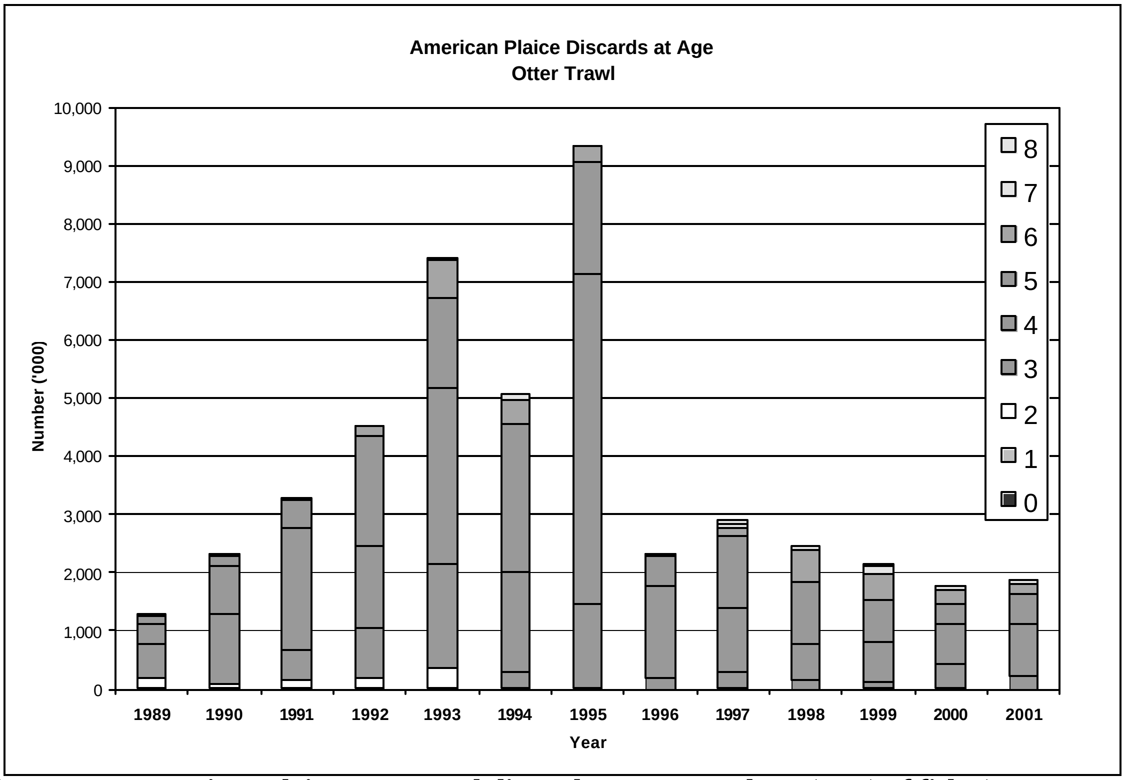


Figure 285 - American plaice otter trawl discards at age, numbers ('000) of fish. (GARM 2002)

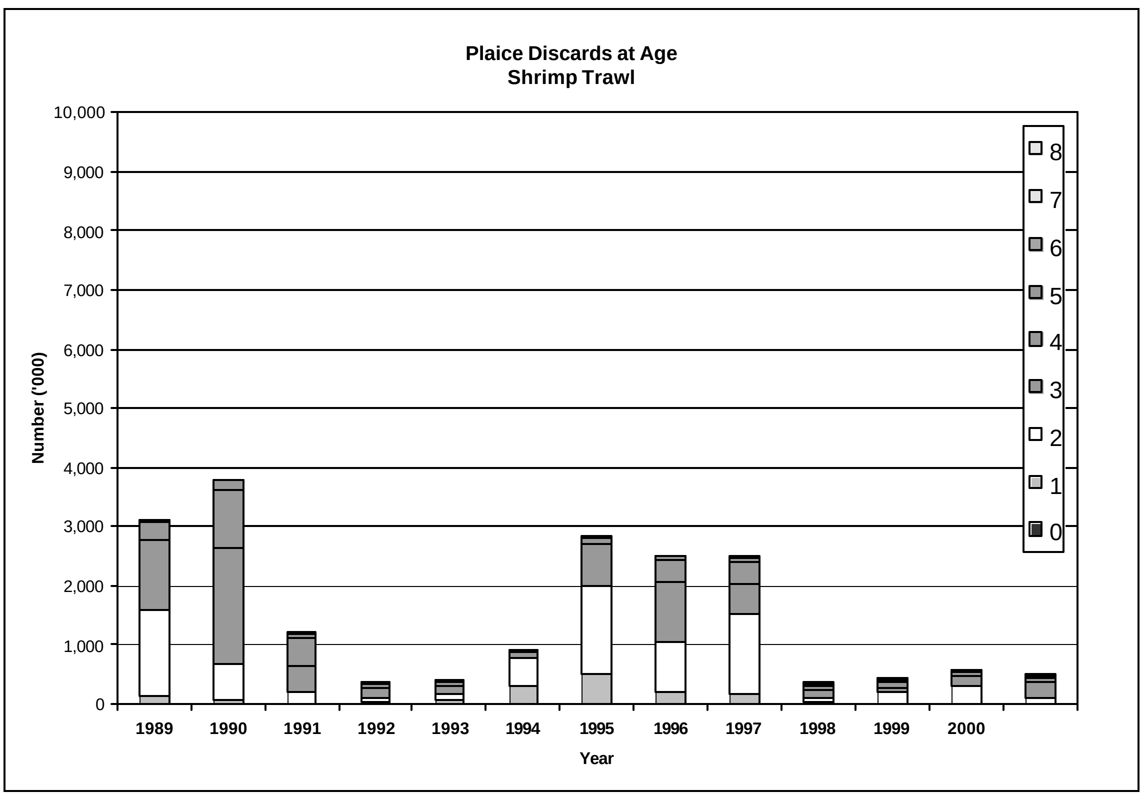


Figure 286 - American plaice northern shrimp fishery discards at age, numbers ('000) of fish. (GARM 2002)

9.4.2.8.3.6 Witch Flounder

Discards in the large-mesh otter trawl fishery and the shrimp fishery were estimated for witch flounder. The primary data source was the sea sampling database for the shrimp fishery, supplemented by various statistical methods in areas with limited data. Because of a lack of observed trips, estimates for the otter trawl fishery were based on a method that uses survey and commercial length at age, gear retention ogives, and information on culling practices (SAW 37) from 1982 – 1994. Since 1995, discards are estimated based on observer data..

Estimates of total witch flounder discards have been 500 mt or less throughout the time period. There does not appear to be a clear trend or major changes in the weight of discards between 1994 and 1999. Discarded weight increased each year from 2000 to 2002. Numbers of discarded fish in both the otter trawl and shrimp fisheries are lower than in 1993/1994. The age of discarded fish also changed, as age 3 fish do not appear in the large mesh otter trawl discards in significant numbers since 1996. Some Age 1 and 2 fish are still caught in the northern shrimp fishery in spite of the required use of the nordmore grate.

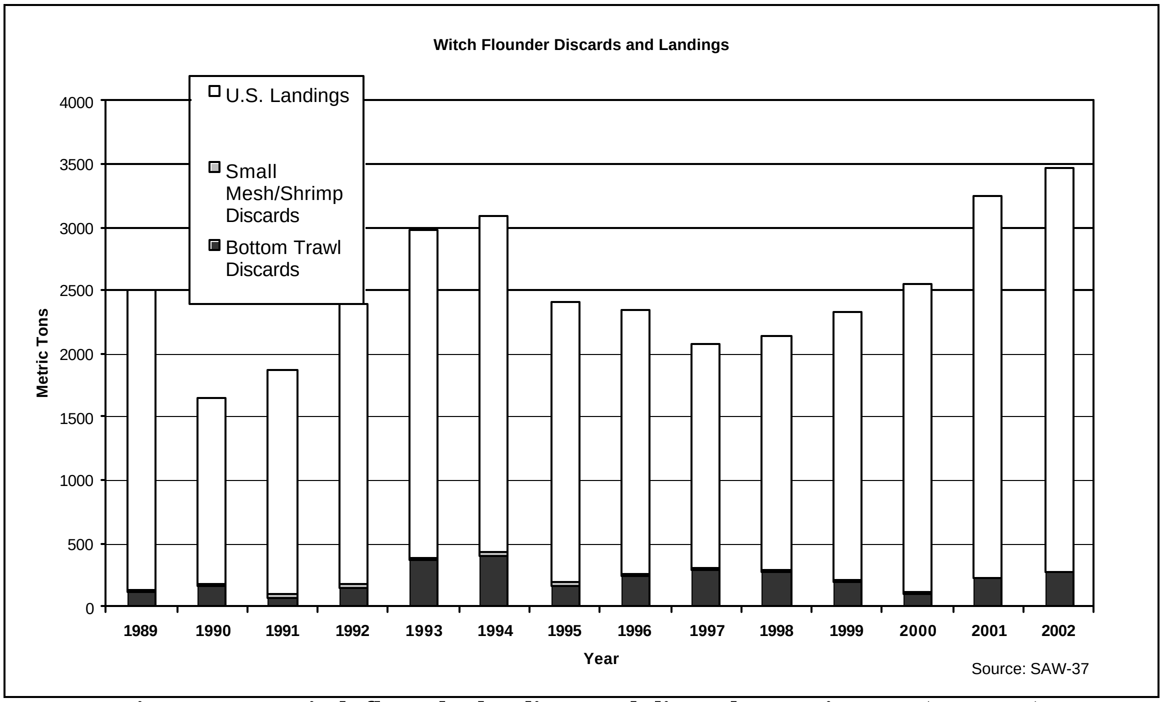


Figure 287 - Witch flounder landings and discards, metric tons. (SAW 37)

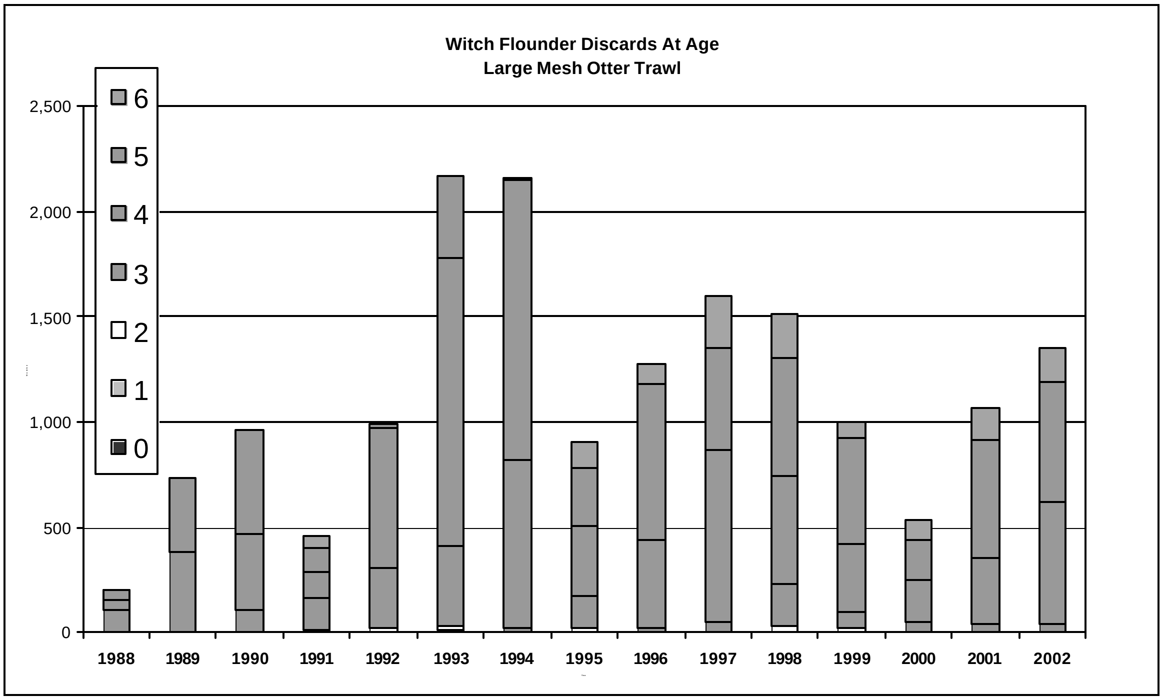


Figure 288 - Witch flounder large mesh otter trawl discards at age, numbers ('000) of fish. (SAW 37)

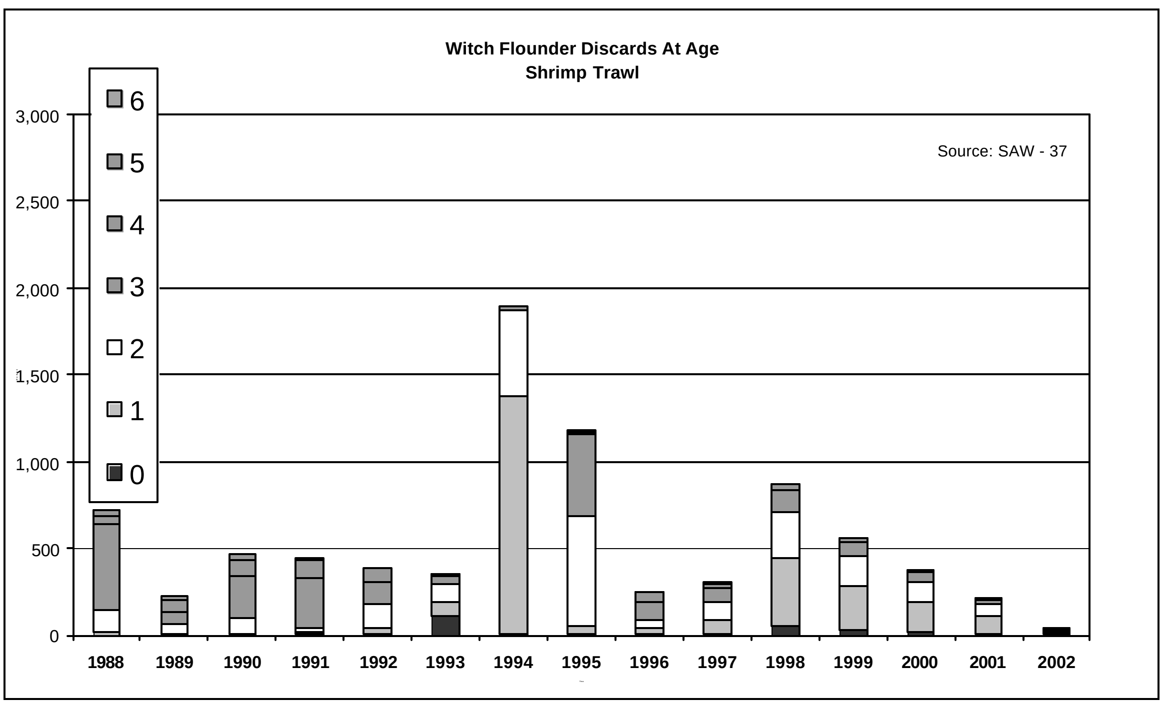


Figure 289 - Witch flounder northern shrimp fishery discards at age, numbers ('000) of fish. (SAW 37)

9.4.2.8.3.7 Cape Cod/GOM Yellowtail Flounder

Prior to SAW – 36, this stock was called Cape Cod Yellowtail Flounder and did not include landings or discards from other areas of the Gulf of Maine Discard estimates were developed since 1963 using a variety of techniques: interviews with vessel captains, observer data when available, and application of selectivity estimates to survey size frequencies. Discards for the recent period of 1989-1997 using the ratio of discarded to landed catch based on sea sampling observations. Discard estimates for all small-mesh trips were combined during the periods 1989 – 1992 Since 1993, shrimp fisheries discards were treated differently than other small mesh fisheries because of different regulations. Large mesh trawl trips were estimated separately (SAW 28).

Estimated discards of CC/GOM yellowtail flounder averaged 22 percent of total catch by weight from 1963 to 1997 (SAW 28). Recent (through 2001) discard estimates are about 20 percent of the catch, with otter trawl gear accounting for about 40 percent of discards, 30 percent from the exempted whiting fishery, and 30 percent from the scallop fishery. Discards declined from 1997 through 2000 with the implementation of the whiting raised footrope trawl, increase in scallop dredge twine top requirements, and changes in trawl mesh requirements. Otter trawl discards increased dramatically to 415 mt in 2001 (from 74 mt in 2000), but the reasons for the increase are not clear.

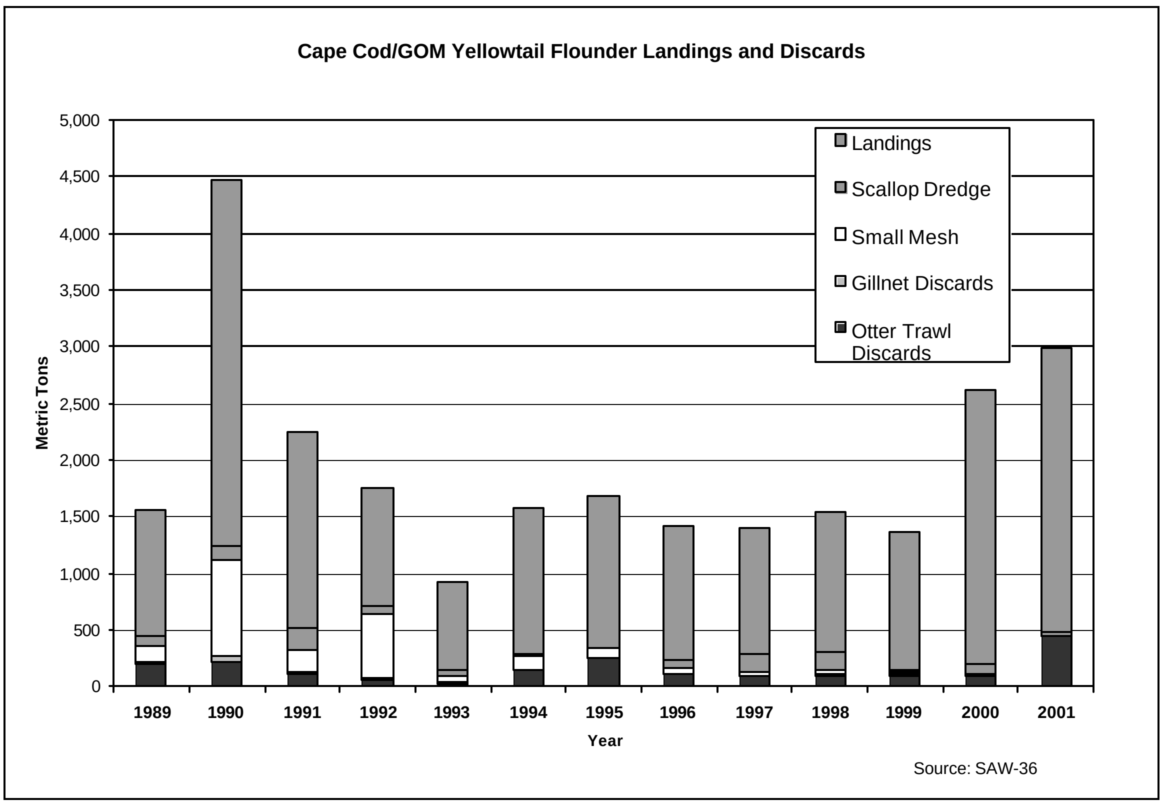


Figure 290 – CC/GOM yellowtail flounder landings and discards by gear, metric tons. (SAW 36)

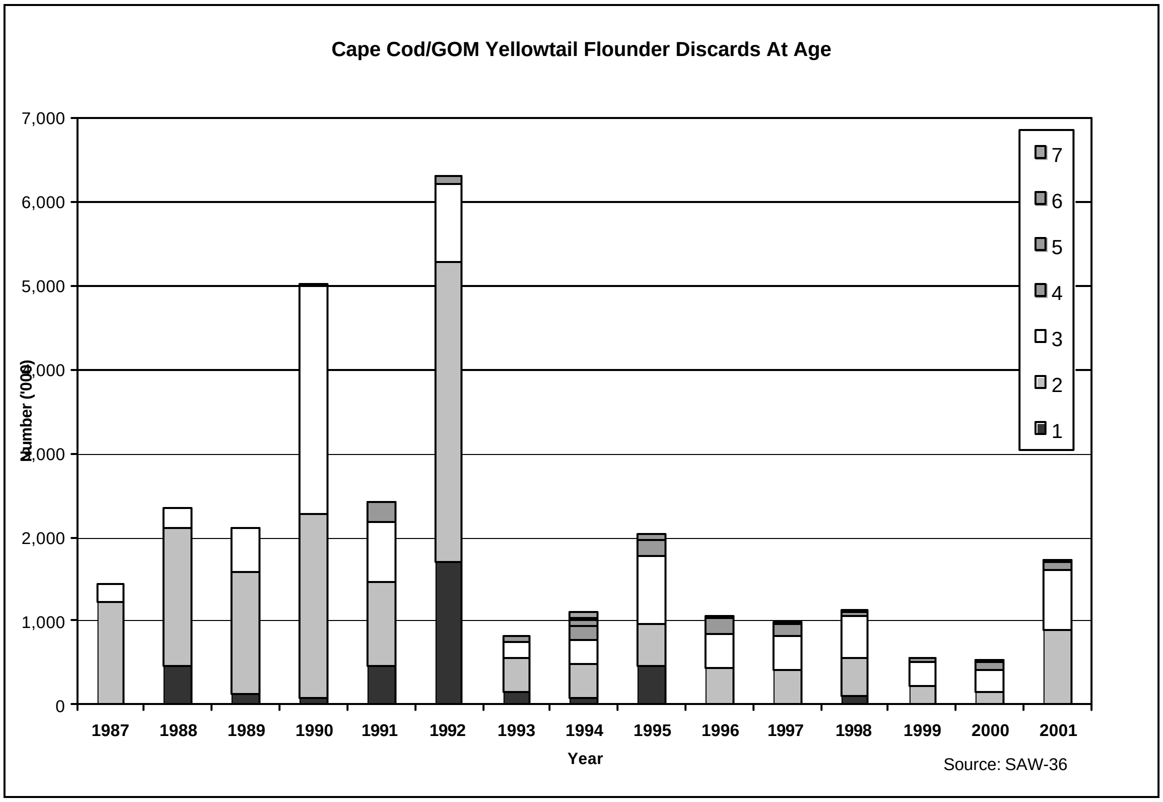


Figure 291 - CC/GOM yellowtail flounder discards at age, numbers ('000) of fish. (SAW 36)

9.4.2.8.3.8 Southern New England/Mid-Atlantic Yellowtail Flounder

Southern New England and Mid-Atlantic yellowtail flounder were assessed as two separate stocks until SAW – 36 (2002). Information on discards is available from a variety of sources, with varying degrees of reliability. SAW 27 estimated SNE yellowtail founder otter trawl discards for the period 1994 – 1997 by using discard ratios from VTRs and pooled length composition from sea sampling. Scallops discards were also estimated using VTRs for the same period (SAW 27).

A major discard event occurred between 1989 – 1991 as a result of a very large incoming year class, lack of appropriate minimum mesh size regulations, and a failure of the management system to react to these circumstances. Discards in 1990 were over 9,000 metric tons. Discard at age estimates for this period clearly show the dominant year class moving through the fishery and being wasted. Both discards and landings declined to low levels in 1993, making it difficult to determine if mesh increases in the trawl fishery, and twine top regulations in the scallop fishery, have reduced discards from this stock.

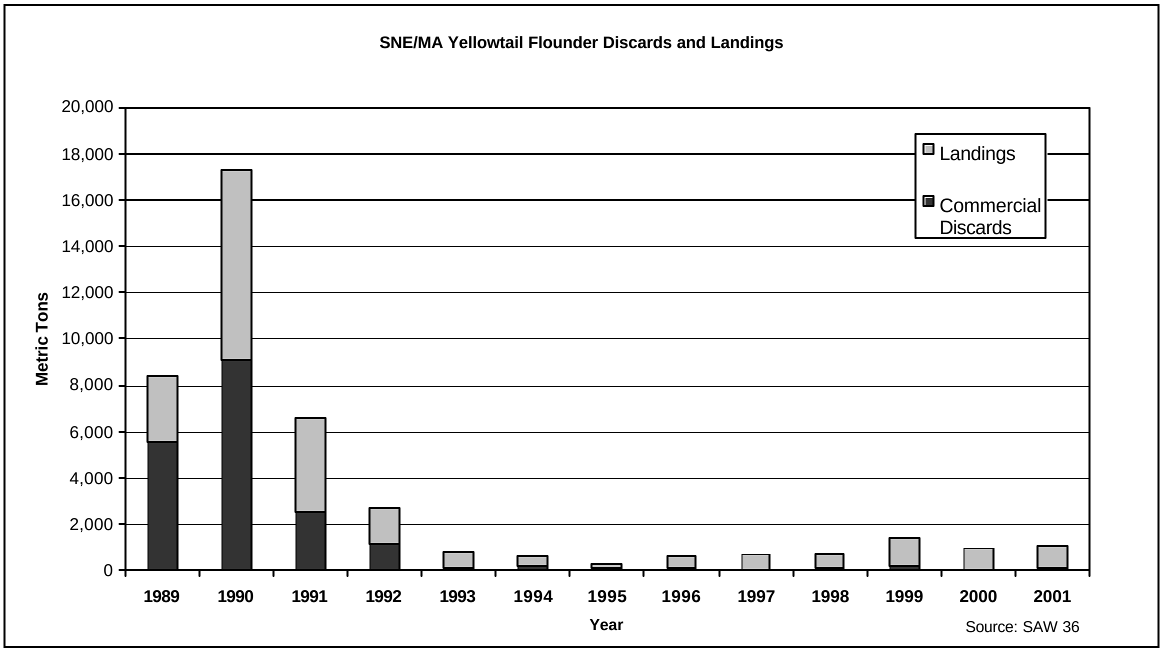


Figure 292 - SNE/MA yellowtail flounder discards and landings, metric tons. (SAW 36)

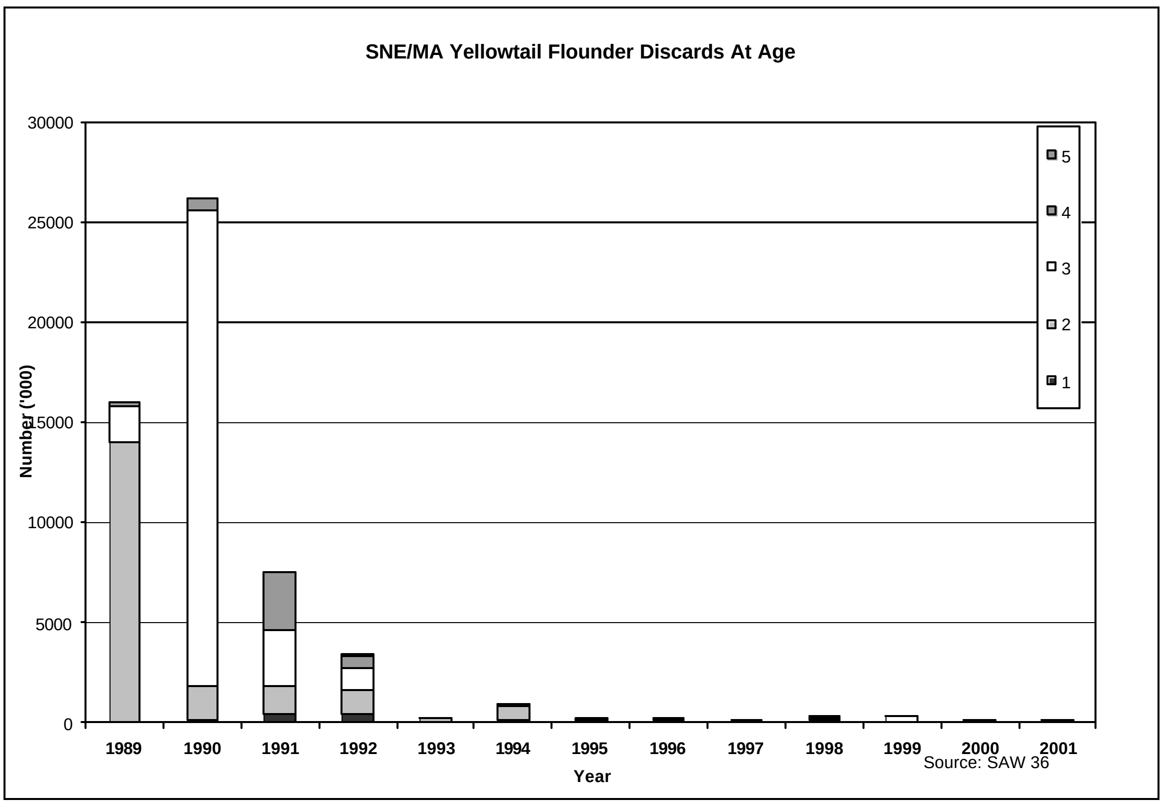


Figure 293 - SNE/MA yellowtail flounder discards at age, numbers ('000) of fish. (SAW 36)

9.4.2.8.3.9 Gulf of Maine Winter Flounder

Discard estimates were developed for both commercial (by gear) and recreational fishing in SAW 36. Commercial discard estimates are based on VTRs, while recreational estimates are based on MRFSS data. Both commercial and recreational discards are adjusted to account for survival of a portion of discarded fish. (SAW – 36)

Commercial discards have been at very low levels since 1993, and have shown little increase (weight) in recent years even as landings have increased. There was a slight increase in the numbers of fish discards in 2001. Discarded fish are primarily age 2 or 3 since 1997. Recreational discards are also at very low levels (numbers), but reflect a broader age disstribution as fish ages 1 through 4 are evenly represented in the recreational discards.

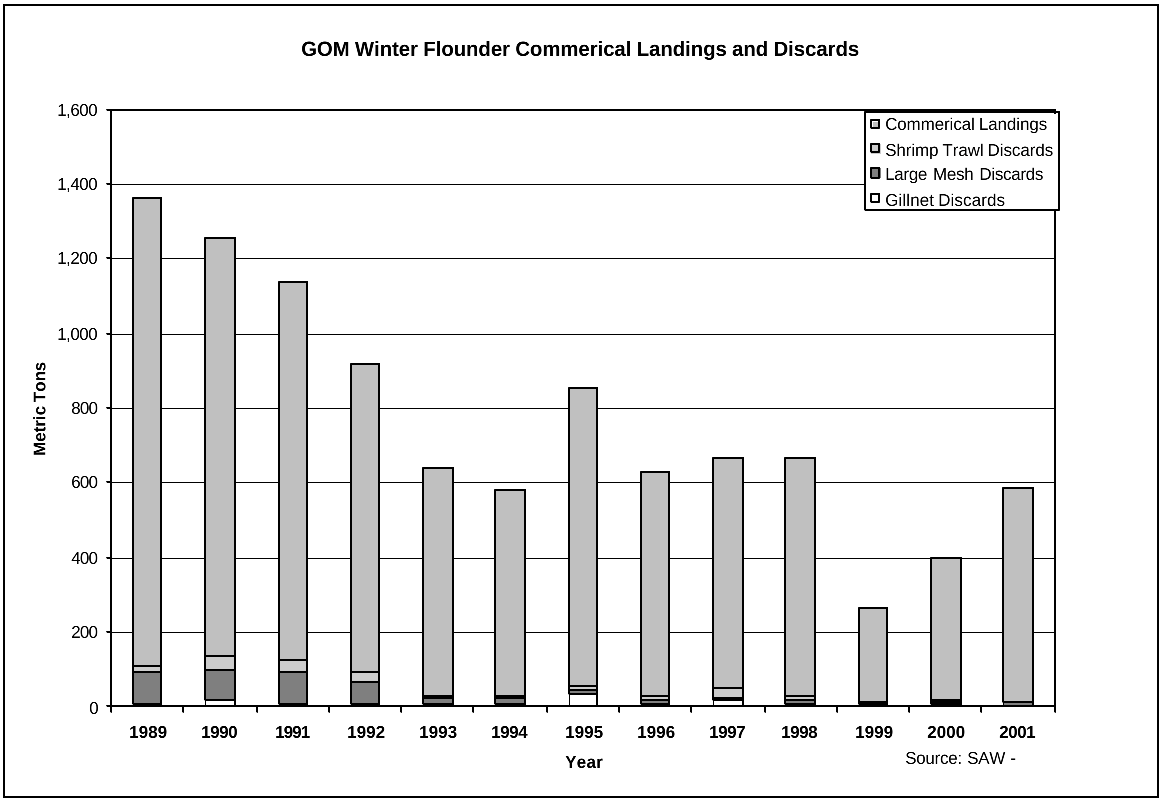


Figure 294 – GOM winter flounder commercial landings and discards, by gear. (SAW – 36)

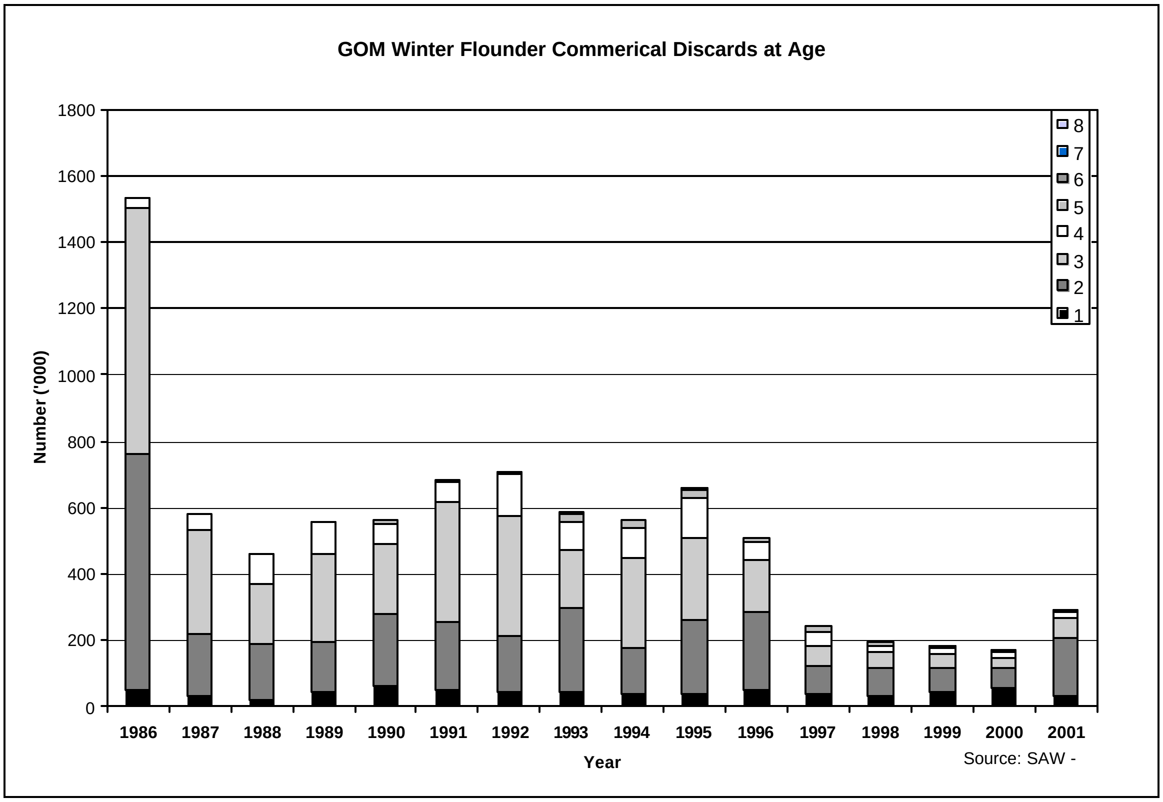


Figure 295 – GOM winter flouncer commercial discards at age, numbers ('000). (SAW – 36

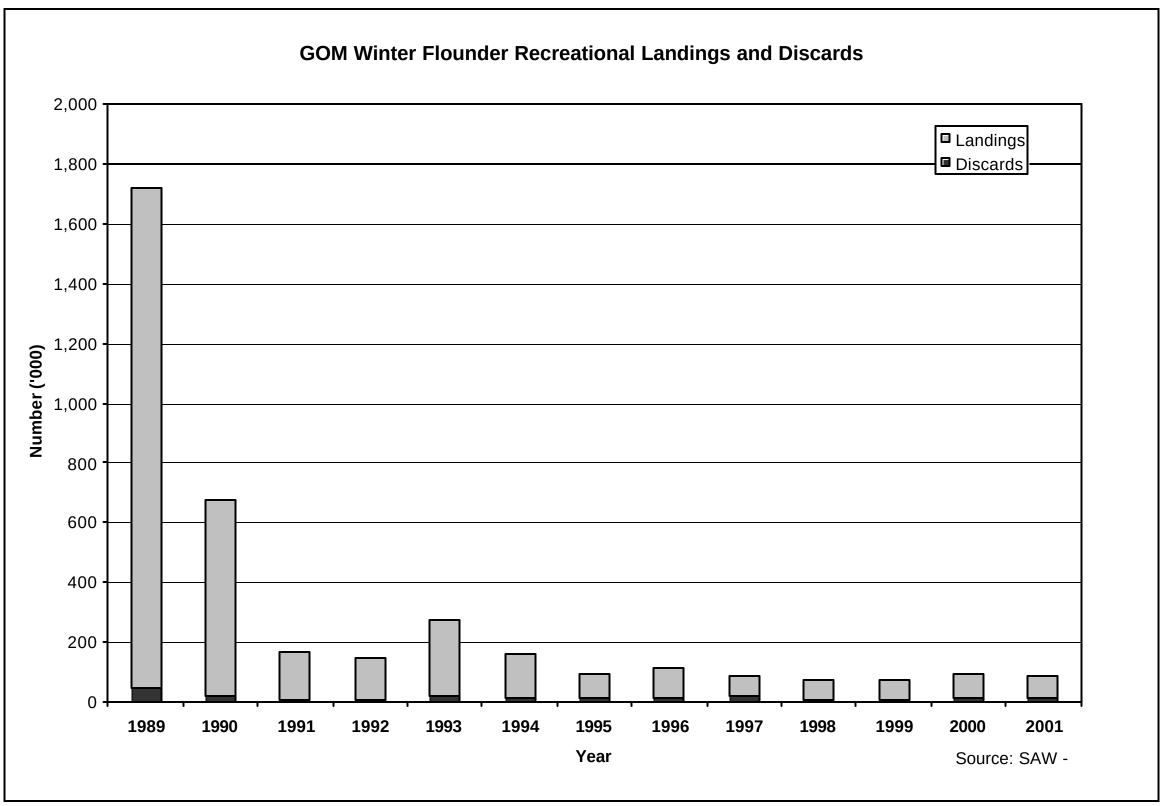


Figure 296 – GOM winter flounder recreational discards, numbers ('000). (SAW – 36)

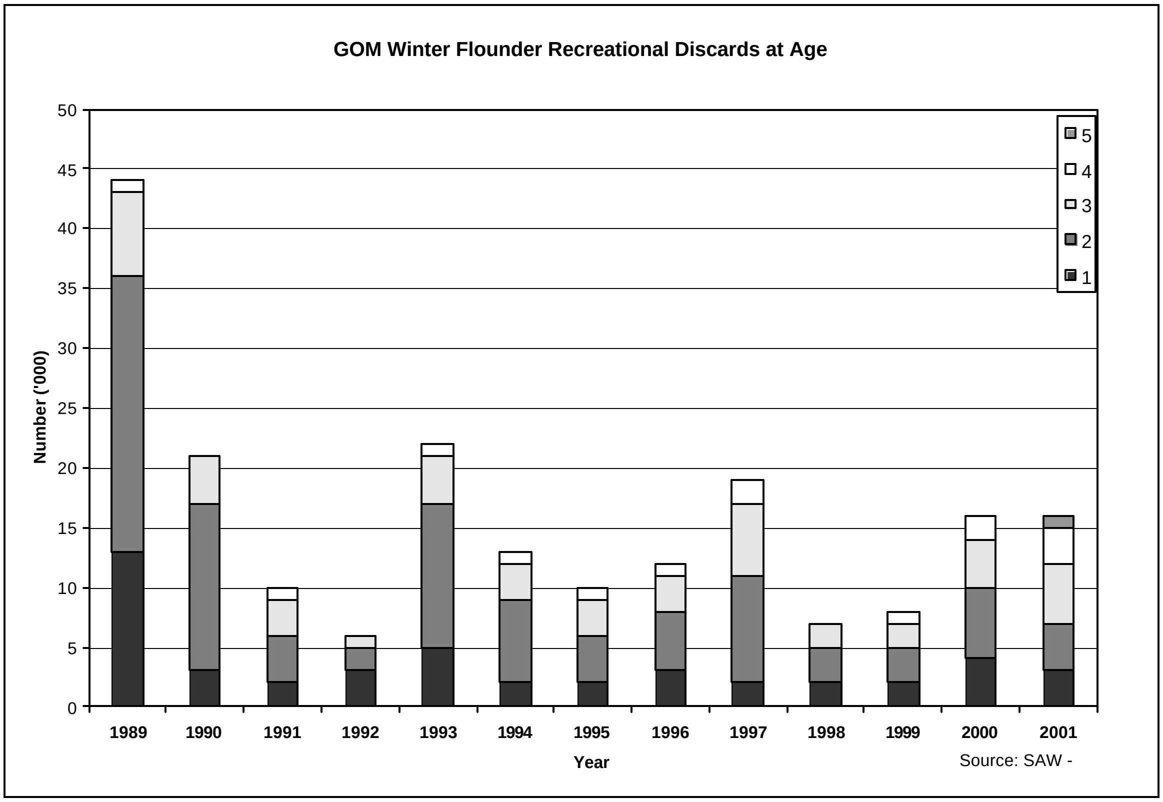


Figure 297 – GOM winter flounder recreational discards at age, numbers ('000). (SAW – 36)

9.4.2.8.4 Other Species

Several other species are discarded by gear capable of catching groundfish.

9.4.2.8.4.1 Skates

Estimates of skate discards were calculated in SAW 30 using discard rates calculated from the Domestic Sea Sampling program applied to landings of target species. While there are seven species in the skate complex, discards were estimated for the entire complex due to the difficulty in skate identification. Discards were also calculated by gear and target species, a level of detail not usually found in other assessments. Skate discards from all fisheries are estimated to be two to eight times the reported total skate landings. The commercial fishery discard mortality, and therefore the total magnitude of skate discard mortality, are unknown.

Figure 298 illustrates skate discards by gear typically used to catch groundfish. The vast majority of discards occur in the otter trawl fisheries. The following tables provide discard estimates by gear and target species. These tables include the number of observed trips used to calculate discard rates. In some instances discard estimates for otter trawls are based on one or two trips. Based on these tables, skate discards from otter trawls using targeting groundfish appear to have declined since 1993.

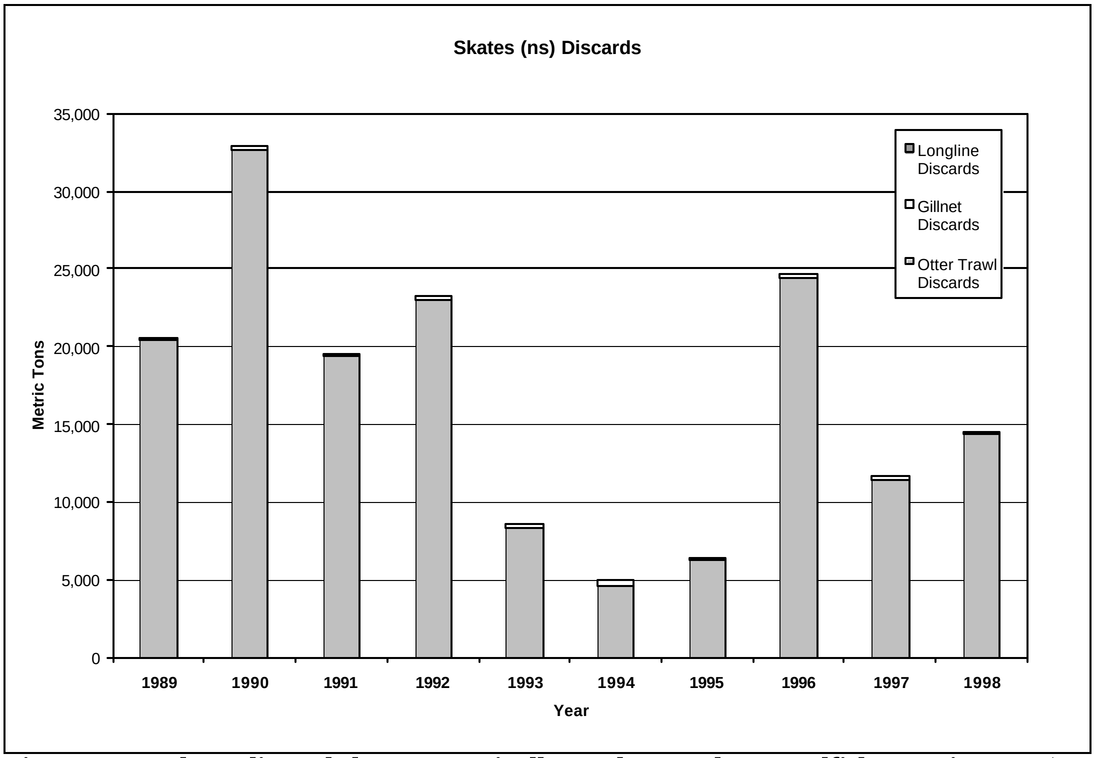


Figure 298 - Skate discards by gear typically used to catch groundfish, metric tons. (SAW 30)

		Goosefish	Principal Groundfish	Pelagics	Flatfish	Small Elasmos	Small-Mesh Groundfish	Scallops	Others	Total
1989	ntrips	1	23	21	18	8	33	0	8	112
	rate	0.700	0.695	0.214	2.306	0.103	0.053	0.048	0.041	
	mt target	1104	5759	29094	3407	5797	14206	3685	1431	64483
	mt discard	773	4002	6220	7855	596	747	178	58	20430
1990	ntrips	1	16	11	21	12	23	0	12	96
	rate	0.082	0.702	0.015	3.059	0.187	0.092	0.048	0.260	
	mt target	474	8822	28144	6891	15687	16398	3912	1166	81493
	mt discard	39	6197	430	21078	2930	1507	189	303	32673
1991	ntrips	9	25	36	26	11	42	0	13	162
	rate	0.139	0.313	0.049	2.266	0.277	0.134	0.048	0.133	
	mt target	2183	5181	41074	4248	13110	12205	7224	1654	86879
	mt discard	304	1621	2002	9627	3634	1630	350	220	19389
1992	ntrips	5	16	18	24	3	33	0	6	105
	rate	0.509	0.404	0.029	1.603	0.992	0.056	0.048	0.295	
	mt target	2445	2838	41649	2883	13673	10534	4608	1482	80112
	mt discard	1245	1146	1226	4622	13560	593	223	438	23051
1993	ntrips	0	4	8	7	6	23	0	5	53
	rate	0.584	0.516	0.001	1.058	0.124	0.067	0.048	0.710	
	mt target	2650	1678	40542	1809	13487	12288	3335	1839	77628
	mt discard	1548	866	20	1913	1666	818	161	1305	8298
1994	ntrips	0	7	11	19	3	0	0	8	48
	rate	0.584	0.255	0.007	0.633	0.035	0.071	0.048	0.014	
	mt target	2429	1443	41876	2177	7718	8014	5703	1315	70674
	mt discard	1419	368	293	1379	268	565	276	19	4586
1995	ntrips	7	7	41	46	20	26	0	28	175
	rate	0.163	0.292	0.088	0.682	0.052	0.016	0.048	0.055	
	mt target	3669	717	33440	2376	6499	8015	6130	1387	62232
	mt discard	597	209	2949	1620	336	129	297	77	6213
1996	ntrips	2	5	40	26	10	45	0	29	157
	rate	3.714	0.980	0.003	0.864	0.251	0.002	0.048	0.019	
	mt target	4556	1273	32999	2721	13868	12385	5600	2015	75417
	mt discard	16923	1248	102	2351	3477	30	271	39	24442
1997	ntrips	4	1	46	17	3	7	0	5	83
	rate	1.313	0.019	0.005	0.563	0.293	0.011	0.048	0.000	
	mt target	4642	1078	30361	4000	8329	10714	3471	3049	65643
	mt discard	6093	20	158	2252	2444	112	168	0	11248
1998	ntrips	0	2	21	13	8	3	1	3	51
	rate	0.584	2.160	0.003	1.016	0.197	0.160	0.048	0.026	
	mt target	4170	1442	44706	4156	12541	10367	4339	2697	84418
	mt discard	2436	3114	150	4223	2467	1663	210	70	14332

Table 518 Estimated Discards of Skates on Otter Trawlers by Year and Primary Species Category

*(**Principal groundfish**: cod, haddock, pollock, and white hake; **pelagics**: herring, mackerel, butterfish, and squid; **flatfish**: summer flounder, winter flounder, American plaice, witch flounder, yellowtail flounder, windowpane flounder and unclassified flounders; **small elasmobranchs**: dogfish and skates; **small-mesh groundfish**: silver hake, red hake, and ocean pout)*

Discards are calculated as the sum of pounds of discarded skates divided by he sum of the pounds of the target species kept in each cell. Cells with zero trips are filled in with the weighted average over all years.

		Goosefish	Principal Groundfish	Pelagics	Flatfish	Small Elasmos	Others	Total
1989	ntrips	2	61	0	2	5	6	76
	rate	0.537	0.004	0.007	0.446	0.010	0.023	
	mt target	5	6552	459	37	3591	961	11605
	mt discard	3	29	3	17	37	22	110
1990	ntrips	0	78	1	12	10	4	105
	rate	0.029	0.011	0.231	0.299	0.007	0.001	
	mt target	10	4573	594	62	7452	814	13505
	mt discard	0	52	137	19	50	1	259
1991	ntrips	42	555	3	11	145	16	772
	rate	0.209	0.013	0.006	0.112	0.003	0.008	
	mt target	251	3326	564	65	7166	984	12357
	mt discard	52	43	3	7	24	8	138
1992	ntrips	44	634	9	63	155	33	938
	rate	0.111	0.015	0.007	0.229	0.005	0.026	
	mt target	765	2987	818	62	7785	1546	13964
	mt discard	85	44	6	14	41	40	230
1993	ntrips	38	371	9	46	70	33	567
	rate	0.047	0.010	0.014	0.109	0.004	0.022	
	mt target	1424	2272	794	53	12009	2615	19167
	mt discard	67	22	11	6	48	58	212
1994	ntrips	107	492	7	15	230	117	968
	rate	0.038	0.002	0.163	0.001	0.009	0.004	
	mt target	2279	1668	753	43	11211	3139	19093
	mt discard	87	3	123	0	99	13	326
1995	ntrips	134	283	10	100	350	126	1003
	rate	0.025	0.002	0.080	0.024	0.007	0.002	
	mt target	3656	1795	325	167	13638	2510	22090
	mt discard	93	3	26	4	92	5	224
1996	ntrips	92	244	17	37	278	127	795
	rate	0.011	0.000	0.007	0.009	0.008	0.001	
	mt target	3155	1697	560	114	15361	2731	23617
	mt discard	36	1	4	1	128	3	172
1997	ntrips	160	237	15	54	308	89	863
	rate	0.011	0.000	0.073	0.002	0.008	0.000	
	mt target	3614	1049	453	77	14882	4947	25021
	mt discard	39	0	33	0	122	1	196
1998	ntrips	155	149	37	53	429	212	1035
	rate	0.018	0.001	0.000	0.006	0.004	0.000	
	mt target	4372	1100	488	306	15365	5578	27208
	mt discard	80	1	0	2	55	1	138

Table 519 Estimated Discards of Skates on Sink Gillnet Vessels by Year and Primary Species Category

*(**Principal groundfish**: cod, haddock, pollock, and white hake; **pelagics**: herring, mackerel, butterfish, and squid; **flatfish**: summer flounder, winter flounder, American plaice, witch flounder, yellowtail flounder, windowpane flounder and unclassified flounders; **small elasmobranchs**: dogfish and skates; **small-mesh groundfish**: silver hake, red hake, and ocean pout)*

Discards are calculated as the sum of pounds of discarded skates divided by he sum of the pounds of the target species kept in each cell. Cells with zero trips are filled in with the weighted average over all years.

9.4.2.8.4.2 Monkfish

The monkfish fishery is closely linked to the groundfish fishery throughout much of its range. In the monkfish Northern Management Area, vessels fishing for monkfish usually do so while on a groundfish DAS, and they are permitted to use groundfish gear. Monkfish discard estimates by gear were calculated in SAW 34 using discard ratios from sea sampling trips applied to landings. The estimates are not based on target species. The following chart shows monkfish discards for otter trawl and gillnet gear without respect to target species (SAW 34).

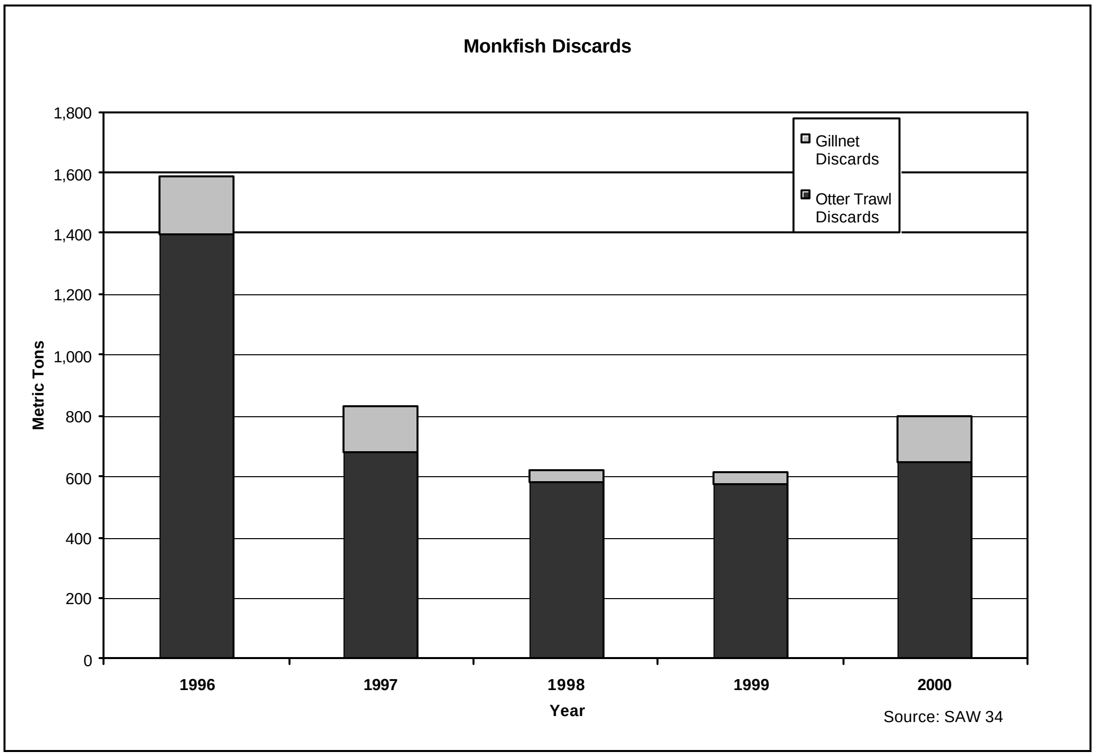


Figure 299 - Monkfish discards, otter trawl and gillnets, metric tons. (SAW 34)

9.4.2.8.4.3 Spiny Dogfish

Spiny dogfish has, in the past, been an important component of the incidental catch by trawl, gillnet, and longline vessels. Seasonal migration of dogfish influences target species for some gear, as vessel operators fish in different areas or different depths to avoid large concentrations of dogfish. Estimates of discards for otter trawl and gillnet gear (without regard for fishery) were included in the Spiny Dogfish FMP (MAFMC 1999). These estimates are shown below (Figure 300). The FMP also included estimates for gear based on target species, and shown in Table 520. These estimates are based on sea sampling data, with few sampling trips targeting some species.

Spiny dogfish discards in gillnet and trawl gear fluctuated from 4,000 to 6,200 mt from 1989 through 1997. Estimates based on target species show that most dogfish discards come from trips targetting cod, white hake, pollock, and winter flounder. There appears to be a slight decline in discards restulting from trips targeting groundfish from 1989 through 1997, perhaps due in part to reductions in fishing effort as a result of Amendment 5. It may also be due to development of a market for dogifsh. Recent management actions make it difficult to predict the trend of discards past 1997 (information that will be available in the summer of 2003). While additional reductions in fishing effort and more seasonal and year round closed areas may have reduced dogfish bycatch, the imposition of strict quotas in the Spiny Dogfish FMP may have converted landings into discards.

A new assessment with updated discard estimates was completed in July, 2003. According to SAW 37, total spiny dogfish discards (all fisheries) were as high as 47,000 mt in 1990 and 1991, considerably higher than the estimates included in the dogfish FMP. Discards declined from 14,100 mt in 1996 to 5,000 mt in 2002, values that are much closer to those reported in the dogfish FMP. These significant reductions in discards are most likely due to effort restrictions in other fisheries, including the multispecies fishery. SAW 37 included estimates of disacrds based on gear and primary species group targeted on a trip. These estimates show considerable variability in the early years of the time series, in part due to limited observer coverage, but the estimates become more stable after 1992. Dogfish discards from trips targeting principal groundfish or flatfish exceeded 30,000 mt in 1989 but have since declined to under 5,000 mt (Figure 301).

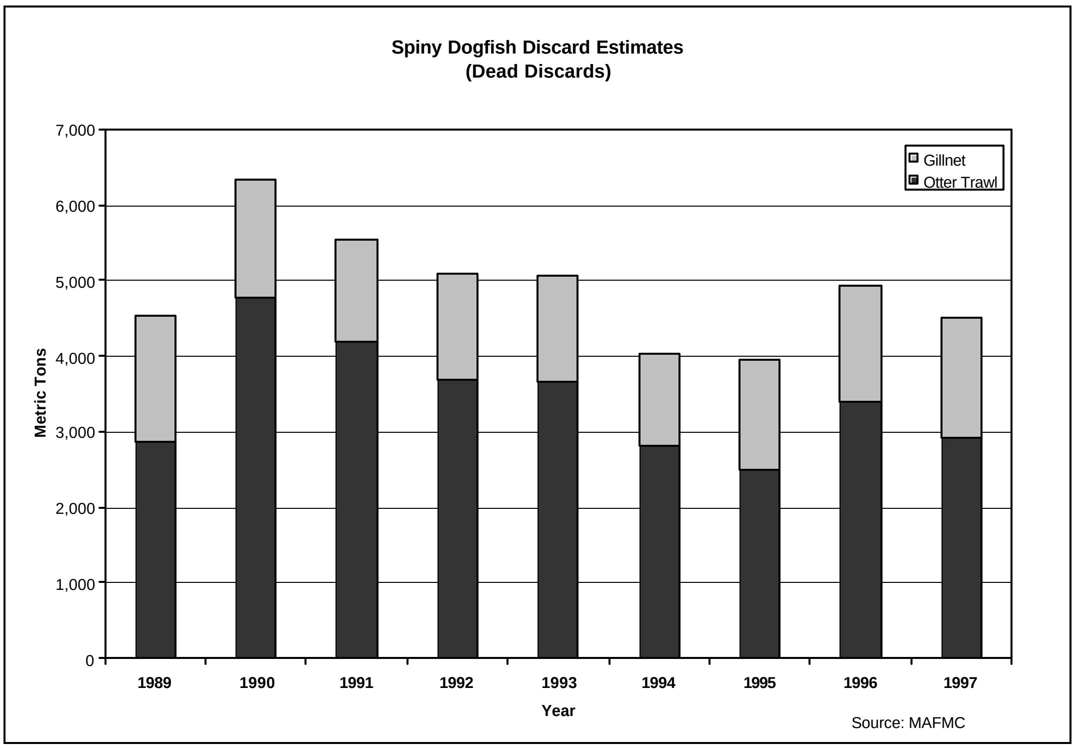


Figure 300 – Estimates of spiny dogfish dead discards for trawl and gillnet gear (Source: MAFMC 1999)

	Trawl									
	Cod	Winter	Witch	Yellowtail	White Hake	Pollock	Plaice	Windowpane	Haddock	Total
1989	648	231	146	232	13	52	2	10	0	1,334
1990	1,213	245	5	1,001	85	45	0	3	0	2,597
1991	740	281	16	275	105	24	2	20	0	1,462
1992	358	220	184	184	157	15	5	6	0	1,129
1993	287	128	126	66	52	6	2	5	0	672
1994	221	140	114	151	4	2	2	1	0	634
1995	95	293	137	37	15	3	2	4	0	586
1996	179	362	187	64	18	4	4	34	0	852
1997	132	562	122	142	2	8	3	1	0	972
	Gillnet									
1989	866	0	0	0	454	505	1,825			
1990	735	0	0	0	335	270	1,342			
1991	729	0	1	0	148	115	994			
1992	466	0	0	0	509	97	1,073			
1993	345	0	0	0	267	116	729			
1994	386	0	0	0	66	47	500			
1995	401	1	0	1	121	43	567			
1996	418	0	0	1	78	29	526			
1997	218	0	0	0	39	44	302			

Table 520 – Spiny dogfish discard estimates (metric tons) by gear and target species (Source: MAFMC 1999)

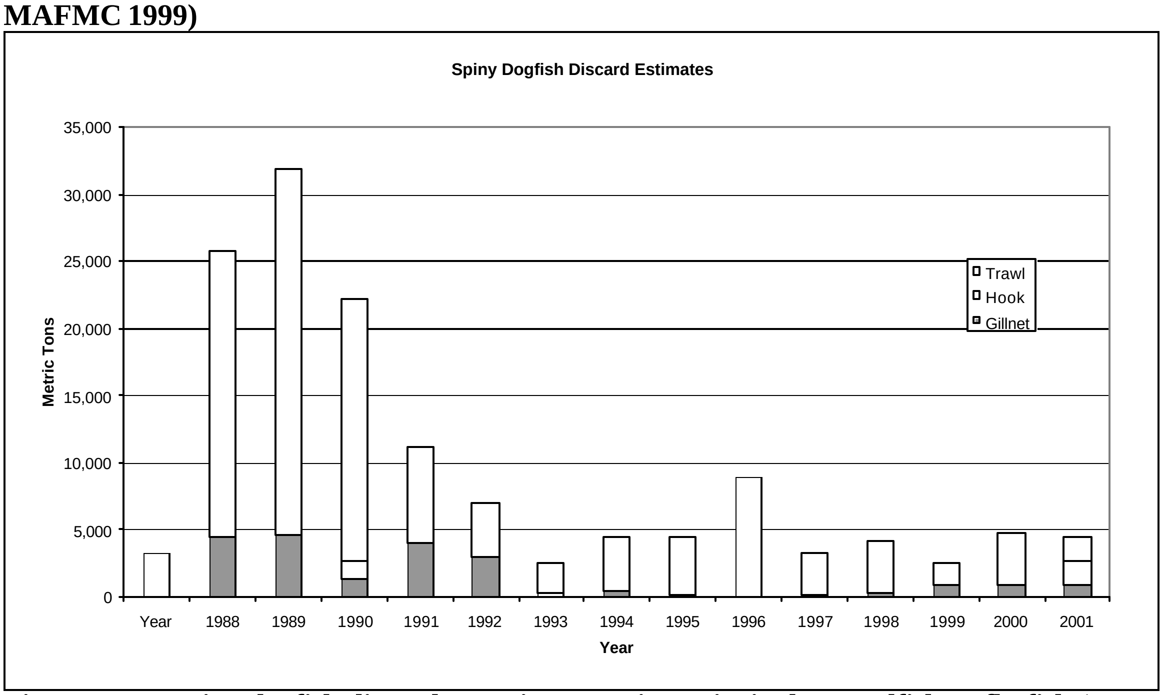


Figure 301 – Spiny dogfish discards on trips targeting principal groundfish or flatfish (Source: SAW 37)

9.4.2.8.5 Measures to reduce bycatch

The SFA amendments to the M-S Act that focused additional attention to bycatch were adopted in 1996, the same year that Amendment 7 was implemented. Since 1996, a number of management measures have been implemented that affected discards and discard mortality in the groundfish fishery. Some were adopted in Amendment 7, while others have been implemented or changed through framework adjustments to the Amendment, or through court order. The impact of these changes can be seen in some of the data shown above, which suggest a shift in the amount and composition of discards beginning in 1996 for many species. In addition, the development of management plans for whiting and monkfish have likely affected discards of groundfish in those fisheries. The impacts of some of these measures cannot be determined because assessments have not been completed since their implementation.

Table 521 provides a brief overview of recent grouindfish management measures that impact discards and discard mortality. This table does not reflect management actions in other fisheries that may have increased or reduced discards.

Date	Action	Measure	Probable Impact
1996	Amendment 7	(1) GOM/GB/SNE minimum mesh size (2) Effort reduction (3) Minimum fish sizes (4) Certified bycatch fisheries program (exempted fisheries program) (5) Limit on groundfish landings by scallop vessels (6) Year round closed areas (7) Increased haddock possession limit to 1,000 pounds	(1) Reduce discards of undersized fish (2) Overall reduction in effort reduces discards of non-target species (3) Minimum fish sizes encourage compliance with mesh regulations, reduce incentive to catch small mesh (4) Established standard for small mesh fisheries, encouraging development of techniques to reduce bycatch. (5) Discouraged targeting of groundfish by scallop dredges, may have increased discards of some flounders. (6) Closed areas may have reduced discards by reducing fishing on spawning aggregations. (7) Increase in haddock possession limit reduced haddock discards as stock began to increase.
May 1, 1997	Framework 20	(1) GOM cod trip limit, included "running clock" (2) Gillnet restrictions including limits on number of nets, additional required days out of the fishery	(1) Running clock mitigated impact of GOM cod trip limit on discards by allowing landings of overages. (2) Additional gillnet restrictions may have reduced discards by limiting effort, but amount of impact uncertain
May 1, 1998	Framework 25	(1) Seasonal closures in GOM and established WGOM closed area (2) Increase to haddock trip limit, including seasonal adjustment (3) Raised footrope trawl required in small mesh areas 1 and 2	(1) By reducing fishing effort during times fish were aggregated, likely reduced discards (2) Haddock trip limit adjustment reduced discards as stock increased (3) Raised footrope trawl reduced discards in whiting fishery in a small area in the GOM
January 19, 1999	Framework 26	(1) Additional closures in inshore GOM during cod spawning	(1) Extended protection to fish (primarily cod) aggregated during spawning
May 1, 1999	Framework 27	(1) Expanded seasonal closed areas in GOM (2) Reduced GOM cod trip limit, including trigger which allowed further reductions in-season (3) Increased haddock trip limit (4) Increased minimum mesh size for square mesh in GOM/GB/SNE RMAs	(1) Extended protection to fish (primarily cod) aggregated during spawning (2) Reduction in trip limit increased cod discards (3) Haddock trip limit increase reduced discards as stock increased (4) Increase in square mesh size reduced discards

Table 521 – Recent management actions affecting discards in the multispecies fishery

Date	Action	Measure	Probable Impact
June 10, 1999	Framework 29	(1) Scallop access program to CA II, including bycatch limits, gear requirements	(1) Several measures reduced discards of yellowtail flounder in CAII access program
June 10, 1999	Scallop Framework 11	(1) Adopted requirement for 8 inch twine top on scallop dredges in all areas	(1) Large mesh twine top demonstrated reductions in groundfish bycatch in scallop dredges
July 29, 1999	Framework 30	(1) Established GB cod trip limit	(1) May have increased regulatory discards by imposition of trip limit, unless vessels able to avoid cod catches
January 5, 2000	Framework 31	(1) Increased GOM cod trip limit to 400 lbs/4000 lbs (2) Extended modified running clock (3) Additional GOM inshore closures	(1) Reduced discards as a result of low FW 27 cod trip limit (2) Change to running clock may have increased discards (3) Extended protection to fish (primarily cod) aggregated during spawning
	Amendment 12	(1) Established regulations for small mesh multispecies	(1) Measures designed to reduce mortality on small-mesh multispecies likely reduced discards of groundfish in this fishery
June 1, 2000	Framework 33	(1) Additional seasonal closures in GOM, including triggered closures (2) Seasonal May closure on GB	(1) Extended protection to fish (primarily cod) aggregated (2) Extended protection to fish (primarily cod) aggregated while spawning
June 15, 2000	Framework 34	(1) Access to groundfish closed areas for scallop dredge vessels, with gear restrictions and bycatch limits	(1) Restrictions reduced yellowtail flounder bycatch in access program
September 1, 2000	Framework 35	(1) Seasonal whiting raised footrope trawl fishery in Upper Cape Cod Bay	(1) Provided opportunity for whiting fishery while virtually eliminating groundfish bycatch
August 1, 2002	FW 33 Court Order	(1) Additional gear restrictions, including increased mesh sizes in all areas and limits on number of gillnets (2) Reduced available effort (3) Additional year round closed area in GOM (4) Yellowtail flounder trip/possession limits in SNE/MA area (5) Mandatory level of observer coverage	(1) Gear restrictions should minimize groundfish discards (2) Fishing effort declines should reduce absolute number of discards (3) Additional year round closed area may reduce discards (4) Trip/possession limits may result in increased discards unless fishermen avoid catch (5) Increased observer coverage should improve discard estimates

Table 521 **(cont.) – Recent management actions affecting discards in the multispecies fishery**

9.4.3 Recreational Harvesting Sector

Overview of Recreational Fishing in the Northeast

Recreational fishing in the Northeast region is monitored through two ongoing data collection systems: the Marine Recreational Fisheries Statistics Survey (MRFSS) and a mandatory logbook program for Federally permitted party/charter vessels. The MRFSS consists of a creel survey that identifies numbers, weight and type of species caught by fishing mode (shore, private or rental boat, and party/charter) paired with a random telephone survey of households to estimate recreational fishing participation and effort. MRFSS randomly samples the fishing activities of individual anglers in the Northeast. The mandatory logbook program, however, records activities of party/charter vessels that carry passengers for hire and that fish in the EEZ for Federally managed species. Species currently covered by mandatory reporting for party/charter vessels are summer flounder, black sea bass, scup, species managed under the multispecies FMP, bluefish, and species managed under the Squid/Mackerel/Butterfish FMP.

In addition to these two ongoing recreational fishery data collection programs, there have been several recent surveys conducted in the Northeast Region that examine recreational fishing in greater depth. In 1994 a comprehensive survey of Northeast recreational anglers was conducted to ascertain angler demographics, participation (Thunberg et. al. 1999), motivations for fishing, preferences for management alternatives (Steinback et. al. 1999), and recreational fishing values (Hicks et. al. 1999). This survey was conducted as a supplement to the MRFSS survey in two regions, as defined for the purpose of the survey: North (Maine to Connecticut) and Mid-Atlantic (New York to Virginia). Although North Carolina is considered part of the Northeast region for management purposes, the MRFSS places North Carolina in the South Atlantic region, so it was not surveyed for these studies.

In examining the demographics of recreational anglers, it was revealed that the majority of recreational fishing participants in the Northeast Region (Maine to Virginia) were white male high school graduates aged 35 to 46 (Thunberg et. al. 1999). Compared to the general population, proportionally more participants held a college or post-graduate degree and had higher household income than non-participants. This was consistent across states as well as the region as a whole. The study projected that the rate of marine recreational fishing participation (the proportion of anglers to total population) will decline while the total number of marine recreational fishing participants increases (Thunberg et. al. 1999). This study will be replicated during calendar year 2002 to identify sources of demographic change among recreational anglers and to update participation forecasts based on 2000 Census data.

In the Northeast Region approximately 50% of anglers reported owning at least one boat that was used for recreational fishing. At least 60% of anglers indicated that fishing was more important than alternative recreational outdoor activities (Steinback et. al. 1999). Most anglers described their motivations for recreational fishing as non-catch (or at least non-keep) related. Approximately 88% of anglers reported that they fish recreationally to enjoy nature and the outdoors. Others fish to relax and escape the daily routine (approximately 84%) and to spend time with friends and family (about 84%). Recreational anglers in the Northeast Region showed greatest support for management measures that establish minimum fish sizes (93%) bag limits (90%), fishing seasons (78%), and limits on areas fished (67%).

In addition to general demographic and attitudinal information, summary data were also collected on recreational fishing expenditures (Steinback et. al. 1999). As a follow-up to the 1994 study, a more detailed survey of recreational fishing expenditures was conducted in 1998 (Steinback and Gentner 2001). In this latter survey, detailed data were collected on trip related expenses (i.e. items that are consumed on a given fishing trip–bait, food, ice, lodging, etc.), purchases that are expected to be used over several fishing trips or seasons (rods, reels, tackle etc.), and items that may be used over many fishing seasons (boats, electronics, vehicles, etc.). Based on these data, a total of $4.2 billion was spent on fishing activities and equipment in 1998 throughout the Northeast Region. Expenditures by coastal state residents were found to be significantly higher than non-coastal resident spending and that recreational participants in Massachusetts, Maryland, and New Jersey had the greatest recreational fishing expenditures.

Expenditures by recreational anglers represent a direct impact on state economies but additional economic impacts are generated including indirect and induced effects. Direct impacts are associated with fishing related retail purchases of goods and services by anglers. Indirect impacts occur as retailers purchase fishing supplies from wholesalers; wholesalers purchase commodities from manufacturers and so on until these "ripple" effects become negligible. Induced effects are associated with changes in household purchasing as the direct and indirectly affected industries pay their employees. The total impact is the sum of direct, indirect, and induced impacts.

The impact of recreational fishing expenditures on total sales, income, and employment was estimated for the Northeast region from the 1998 expenditure survey data (Steinback, Gentner, and Castle; forthcoming). Using IMPLAN Pro (an input-output modeling system) the authors found that the total local economic impact of recreational fishing was less than total local expenditures. This finding is due to the fact that a large portion of the value of retail sales was imported from outside the local area. For example, a fishing rod may be purchased at a retail store in Delaware but if the retailer purchased it from a distributor located in New Jersey then the amount of economic impact that stays in Delaware is a fraction of the retail value. The local area sales impact ranged from a low of $0.44 per $1 in fishing expenditures in Rhode Island to a high of $0.64 in New Jersey.

The studies described above were based on broad-scale data collection for the North and Mid-Atlantic regions. Additional studies have focused on recreational fishing activities for specific states. Salz et. al. (in press) conducted a survey of anglers in Massachusetts. Massachusetts anglers indicated a variety of motivations for fishing, many of which were non-catch related including relaxing and being outdoors. Party/charter anglers tended to place greater emphasis on the social aspects of fishing than private boat or shore anglers. At least 50% of individual anglers agreed that a trip could be considered "successful" even if no fish were caught. Party/charter anglers tended to place greater emphasis on catch in defining a trip's success.

Salz et. al. also investigated constraints to increased fishing activity and reasons for switching from party/charter fishing to alternative fishing modes. The major reason why people would not fish was time constraints imposed by a job or alternative recreational activities. Lack of fish or low catch rates were not often cited as reasons for fishing less frequently. Similarly, fewer than 10% of interviewed anglers stated that their fishing frequency was related to restrictive regulations.

The party and charter boat industries in Maine, New Jersey, and New York were the subject of three separate studies respectively by McCay and O'Neil (1998), McCay, O'Neil, and Velchek (1999), and McCay et. al. (1999). Each of these studies describes various social and economic characteristics of the party/charter industry and its operators. The key findings for each of these studies are summarized below.

The majority of Maine party/charter operators surveyed in 1996 were predominantly engaged in charter trips only, owned only one boat used for fishing, and indicated that operating a party/charter business was among their most favored occupations. Due to the relatively short fishing season in Maine a large percentage (89%) of surveyed operators supplemented their income with a source other than fishing. A majority of captains were between 31 and 50 years of age and had been in the party/charter business for 10 or fewer years. In 1996, survey participants in Maine averaged 27 half-day fishing trips (approximately 4 hours each) and 44 full-day trips (approximately 8 hours each). On average, five passengers were taken per trip, approximately 75% of the passengers being out-of-state residents. Among those surveyed, the primary target species was striped bass (a likely reflection of the dominance of charter captains in the sample) followed by cod, shark, tuna, and bluefish. Among those sampled, vessels that were engaged in a combination of party and charter fishing were barely breaking even on each trip while captains that specialized in charter trips only were earning a modest profit of $26 per trip. Note that these estimates were based on averages across all expense categories including fixed and operating costs so there is likely to be wide variation in profits and losses among different vessels.

In New Jersey the party/charter industry surveyed during calendar year 1997 was, as in Maine, dominated by boats that specialize in charter trips (73%). These charter vessels averaged 9 half-day and 51 full-day fishing trips in 1997. Charter boats took an average of 7 passengers per trip, more than half of these New Jersey residents. Boats that specialize in party trips only took an average of 169 half-day and 175 full-day trips in 1997. On average, these boats carried 27 passengers on half-day trips and 20 passengers on full-day trips, nearly three quarters of which were New Jersey residents. Vessels that conducted a combination of party and charter trips averaged 92 half-day trips, with 24 passengers per trip, and 108 full day trips, with 21 passengers per trip in 1997. Species targeted by New Jersey party/charter captains included fluke, bluefish, striped bass, tuna, weakfish, winter flounder, and shark. New Jersey captains indicated that these choices reflected a combination of species availability and degree of regulatory restrictions but may not necessarily reflect what they or their clients would prefer to target. As was the case in Maine, most New Jersey captains considered themselves to be part-time operators while supplementing their income with other jobs particularly during the winter season. Although the largest proportion of New Jersey operators had been in business less than 10 years, the majority of operators across the sampled region had been in continuous operations for 11 or more years, with 28% in business for more than 20 years.

The New York party/charter fleet was surveyed in 1997. The composition of the fleet was similar to that of New Jersey and Maine with the majority (69%) of captains specializing in charter trips only. Across all combinations of activity the majority (over 83%) of passengers on New York party/charter vessels were New York state residents. Boats specializing in charter trips made an average of 33 half-day and 63 full-day trips and carried approximately 7 passengers per trip. Boats specializing in party trips made an average of 190 half-day and 179 full-day trips in 1979 and carried between 22 and 26 passengers per trip. Captains that offered a mix of party and charter trips took an average of 113 half-day and 156 full-day trips and carried 22 to 24 passengers per trip. The composition of targeted species was similar to that of New Jersey boats and included fluke, striped bass, shark, tuna, winter flounder, bluefish, and cod. New York captains also had alternative income sources and noted high levels of job satisfaction in their current occupation. However, like their New Jersey and Maine counterparts, New York operators expressed concern about disagreements regarding stock status for popular recreational species, the balance of recreational and commercial interests in the fishery, and difficulty in maintaining a position on the waterfront as urbanization and competing non-water dependent activities drive up the price of docking space.

9.4.3.1 Long Term Trends in Northeast Recreational Fishing

Total combined catch (kept catch plus all discards) of all species during calendar year 2000 was the highest on record since 1986 in both the MRFSS North Atlantic (38.2 million) and Mid-Atlantic (129.1 million) regions (Table 522). Prior to calendar year 2000, total catch had been fluctuating within relatively narrow range of between 21 and 25 million fish from 1993 to 1999. In contrast, catch in the

Mid-Atlantic region has not only been significantly greater than the North Atlantic but the variability in catch has also been much greater.

		Total Fish Caught (millions)	Trips (millions)		Participants (millions)	
	North Atlantic	Mid-Atlantic	North Atlantic	Mid-Atlantic	North Atlantic	Mid-Atlantic
1981	37.0	100.8	5.8	14.0	1.0	2.3
1982	46.7	81.1	7.0	15.5	0.8	2.0
1983	35.2	125.0	7.1	18.6	1.1	2.6
1984	24.6	101.1	5.3	15.8	1.0	1.9
1985	41.1	90.8	7.1	14.7	1.1	1.9
1986	49.9	153.9	7.5	18.8	1.2	2.2
1987	34.3	99.9	5.8	14.7	0.9	1.9
1988	25.7	77.9	5.7	14.9	1.0	1.8
1989	24.6	64.6	5.2	12.2	1.0	1.8
1990	18.7	84.6	5.5	13.4	1.0	1.8
1991	26.7	126.0	6.8	16.0	1.2	2.2
1992	17.7	75.0	5.7	12.2	1.0	1.6
1993	21.0	97.6	6.2	15.3	0.9	2.1
1994	25.9	94.9	6.3	16.2	0.8	2.3
1995	22.0	88.5	6.5	15.6	0.9	1.9
1996	23.4	86.4	6.8	16.5	1.0	2.0
1997	24.4	103.2	7.6	17.2	1.1	1.9
1998	23.5	54.6	6.8	14.5	1.0	1.8
1999	23.4	85.9	6.5	14.1	0.8	1.7
2000	38.2	129.1	8.4	18.8	1.1	2.0
2001	33.3	114.8	9.0	21.2	1.1	2.5

Table 522 - Total catch, trips and participants in MRFSS North and Mid-Atlantic Regions (1981-2001).

Source Data: MRFSS database. Years denote calendar years. Catch and landings are expressed in numbers of fish.

The greatest total number of recreational fishing trips from 1981 to 2001 in the North Atlantic occurred in 2001 at 9.0 million. In that year, the greatest number of recreational fishing trips also occurred in the Mid-Atlantic at 18.2 million (Table 522). Since 1981, total trips in the North Atlantic states have ranged from between 5.2 and 9.0 million but the number had been relatively stable from 1993 to 1999 (between 6.2 and 7.6 million trips). The number of trips taken in the Mid-Atlantic region was also fairly stable, ranging from 14.1 million to 17.2 million over the same time period. It is not known why both catch and numbers of trips were so high in both 2000 and 2001 compared to previous years especially since the number of participants in both regions did not exceed the historically observed range.

In the North Atlantic states catch per trip fluctuated from 1981 to 1986, with a downward trend until 1992 before becoming relatively constant through 1997 (Figure 302). Catch per trip in the North Atlantic region increased three consecutive calendar years from 1998 to 2000 but dropped in 2001. The average number of trips taken per angler or participant was quite variable from 1982 to 1989, followed by a general upward trend to 1994. Since 1994, the average number of trips taken per recreational anglers has been between 7 and 8 per year but did rise to just over 8 trips in 2001. Prior to 1990, the recreational fishing partic ipation rate (number of participants/total coastal state population) was above 8% in every year except 1982, 1987, and 1988. Since 1990, the participation rate has been above 8% in only four of the eleven years (1991, 1997, 2000 and 2001).

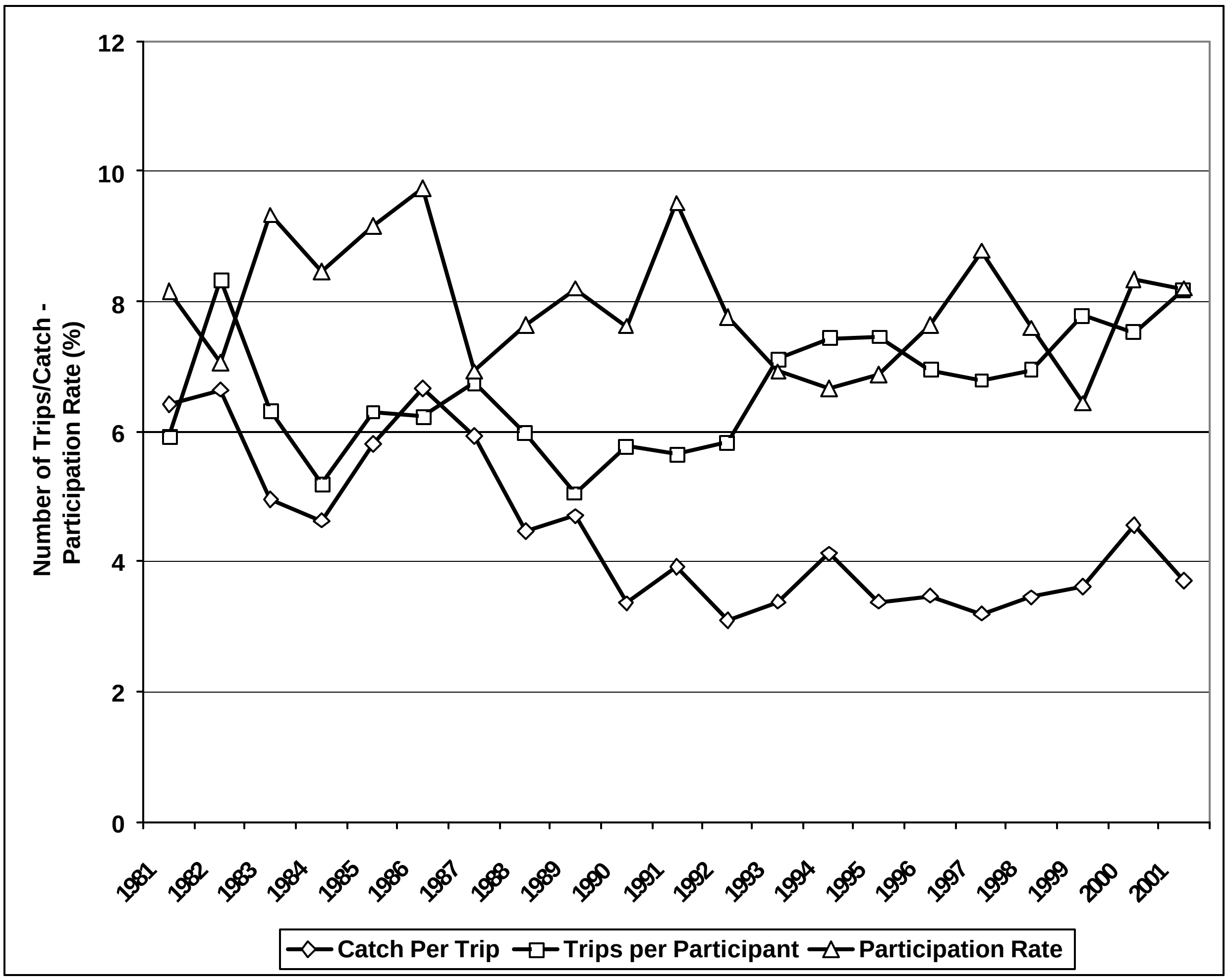


Figure 302 - Annual catch per trip, trips per angler, and participation rates for the North Atlantic States, 1981-2001

Source Data: MRFSS database. Years denote calendar years.

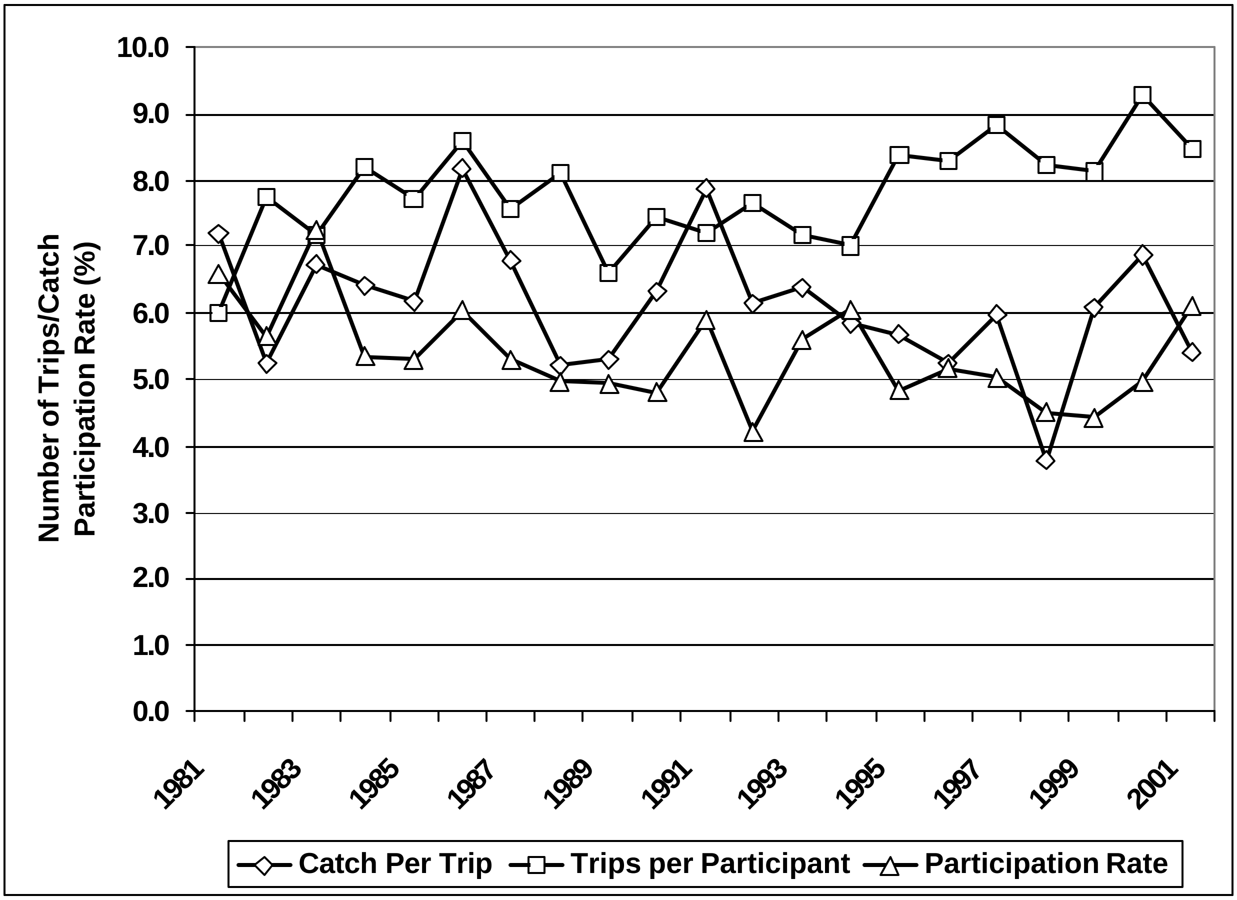


Figure 303 - Annual catch per trip, trips per angler, and participation rates for the Mid- Atlantic States, 1981-2001 ***Source Data: MRFSS database. Years denote calendar years.***

In the Mid-Atlantic states catch per trip fluctuated from 1981 to 1988, but was on a consistent downward trend from almost 8 fish per trip in 1991 with a downward trend before ending at 5.2 fish in 1996 (Figure 303). Since 1996 average catch has fluctuated with any distinct trend between a low of less than 4 fish in 1998 to a high of 7 fish in 2000. Even as average catches were declining in the early to mid-1990's the average number of trips per angler was increasing and has remained at between 8 and 9 trips per year since 1995. The Mi-Atlantic participation rate had been on a general downward trend from 1981 to 1999 falling from almost 7 percent to less than 5 percent. However, the participation rate in both 2000 and 2001 increased and was over 6 percent in 2001.

9.4.3.1.1 Trends in Recreational Catch and Trips by Group, 1990–2001

Total trips, catch, and mortality (kept catch plus discarded dead) were higher in calendar year 2000 for shore and private boat anglers than any other year since 1990 and were higher still in 2001 (Table 523). In contrast, trips, catch and mortality for party/charter vessels were higher in 2001 than in the previous three years, but were still within levels observed over the past decade. The average total number of trips from 1990 to 1995 was 2.1 million greater than the average from 1995 to 2001 for shore anglers, 0.5 million fewer for party/charter boats, and 2.2 million greater for the private boats. Total catch shows a similar pattern although average total mortality across all groups was lower from 1995 to 2001 than from 1990 to 1995. This reduction in mortality or mortality as a percent of catch appears to be consistent throughout the time period (Figure 304) and may be due to a change in management regulations that reduced the number of fish that anglers may keep. Another contributing factor may be increasing emphasis on catch-and-release fishing. Catches may continue to increase, as observed, while reducing the overall mortality. Note that this relationship may be enhanced as discard survival can be increased either by changes in catch-and-release technique or the use of less injurious fishing tackle or methods (barbless hooks and circle hooks, for example).

	Total Trips (millions)			Total Catch (millions)			Total Mortality (millions)		
Year	Shore	Party/ Charter	Private/ Rental Boat	Shore	Party/ Charter	Private/ Rental Boat	Shore	Party/ Charter	Private/ Rental Boat
1990	8.6	2.0	12.2	22.9	16.5	81.6	13.2	12.0	40.5
1991	10.9	2.3	13.3	41.0	19.4	107.4	20.5	13.6	50.0
1992	9.5	1.6	11.2	23.6	12.2	73.3	11.8	8.1	35.9
1993	10.3	2.7	13.2	30.2	21.7	83.4	13.8	13.9	33.5
1994	11.6	2.5	13.5	43.6	15.7	88.3	24.9	9.8	34.9
1995	12.0	2.4	12.8	32.3	21.2	76.7	14.2	13.3	26.1
1996	12.2	1.7	13.3	26.5	13.2	80.9	9.7	7.8	29.9
1997	12.7	2.3	14.8	29.8	20.9	95.4	11.5	12.4	33.5
1998	10.7	1.5	13.6	28.3	8.7	88.7	9.6	4.7	29.1
1999	10.7	1.4	13.1	28.0	10.5	87.5	8.3	5.6	26.1
2000	14.1	1.6	17.6	50.0	14.3	125.2	26.0	7.6	40.0
2001	16.1	1.8	19.0	35.9	14.5	121.5	12.0	7.0	39.6
‘90-’95 Avg.	10.5	2.3	12.7	32.3	17.8	85.2	16.4	11.8	36.8
‘95-’01 Avg.	12.6	1.8	14.9	33.0	14.7	96.6	13.0	8.3	32.0

Table 523 - Number of trips, total catch, and total mortality by fishing mode. 1990-2001.
** Data include trips for the entire Northeast Region including North Carolina.*
Source Data: MRFSS database. Years denote calendar years. Catch and mortality are expressed in numbers of fish.

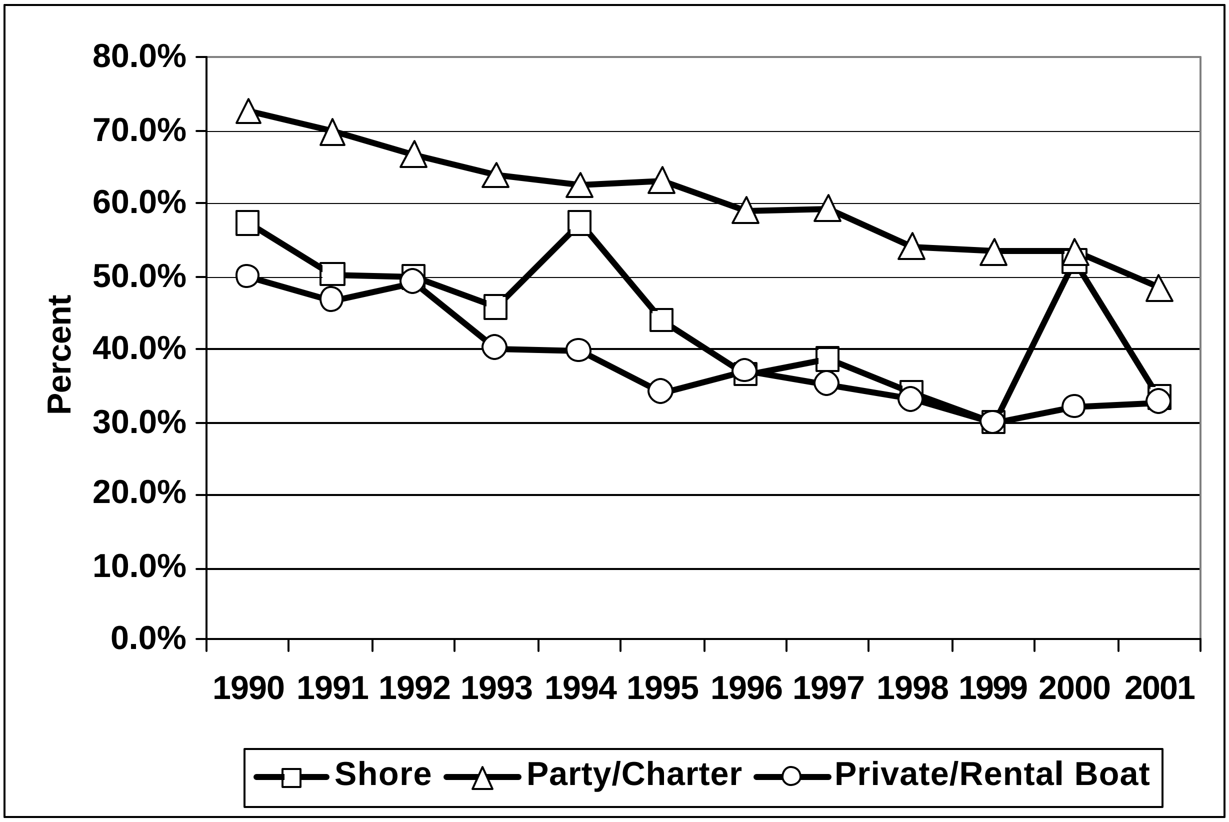


Figure 304 - Mortality as a percent of total catch by recreational fishing mode
Source Data: MRFSS database. Years denote calendar years.

The proportion of trips taken by fishing mode indicates that some switching between modes may be occurring with a general shift away from party/charter fishing toward the expanded use of private boats (Figure 305). This shift was noted by Salz et. al. (in press) in Massachusetts and may be a region-wide occurrence which appears to be more evident since 1995. Reflective of this apparent shift in fishing mode, the proportion of total recreational mortality attributed to party/charter anglers has declined while that attributed to private boats has increased since 1995 (Figure 306).

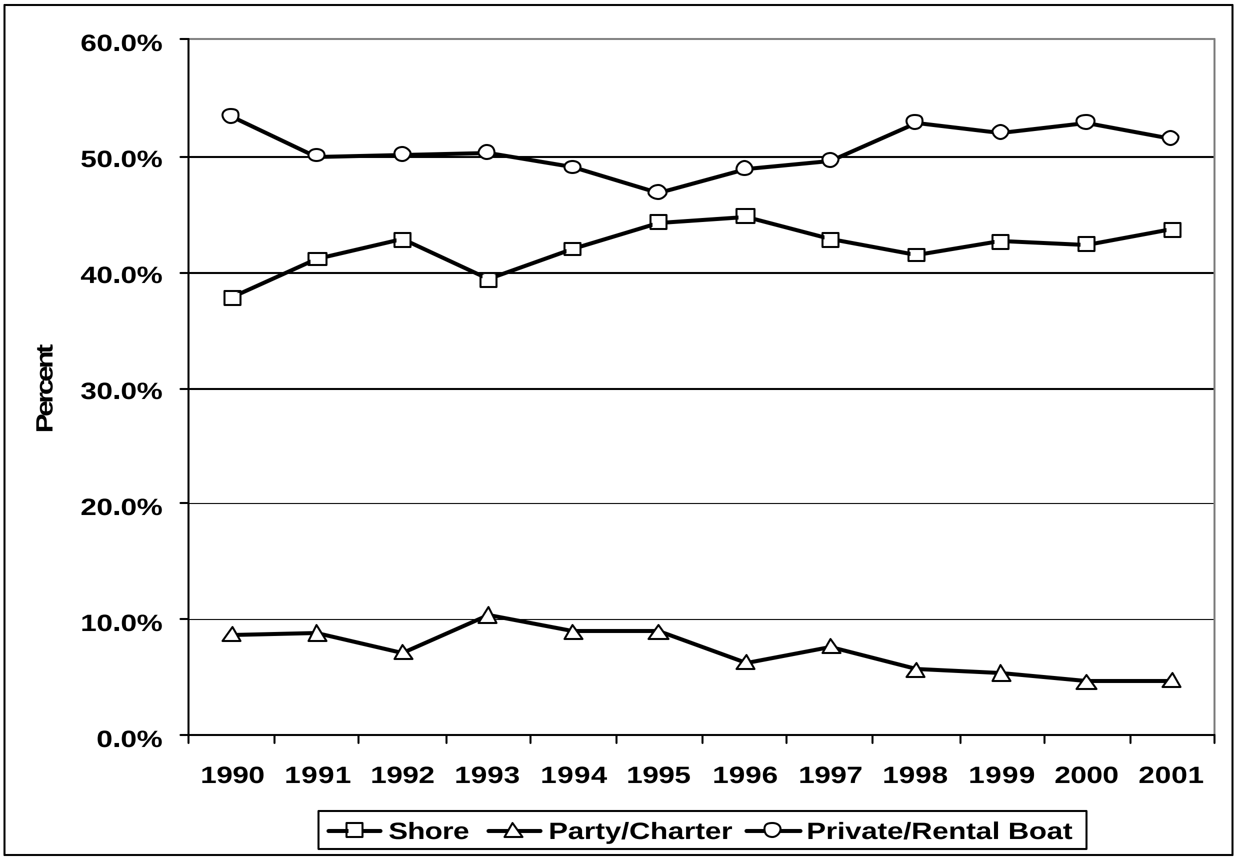


Figure 305 - Percent of total trips by recreational fishing mode. 1990-2000.
Source Data: MRFSS database. Years denote calendar years.

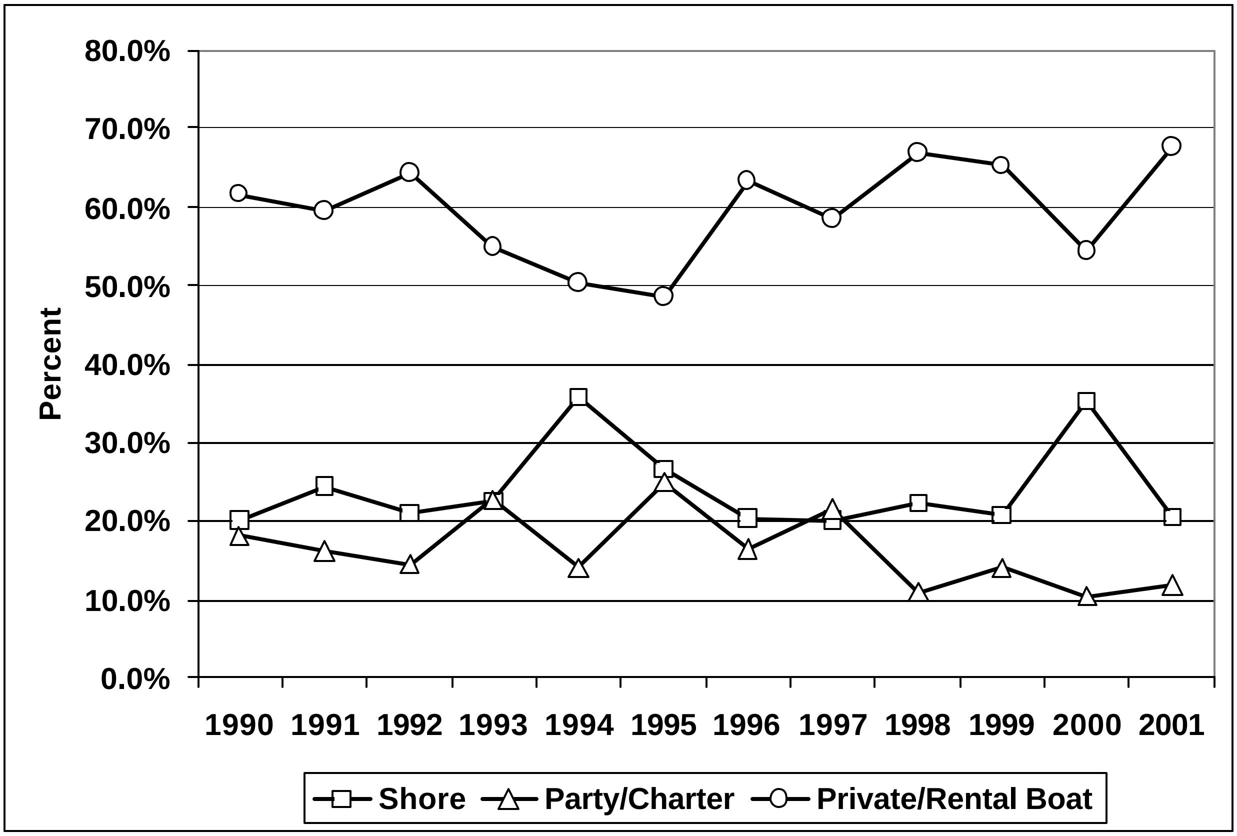


Figure 306 - Percent of total mortality by recreational fishing mode. 1990-2000
Source Data: MRFSS database. Years denote calendar years.

9.4.3.2 The Role of Groundfish in Northeast Region Recreational Fisheries

Since 1990, the combined recreational catch of regulated multispecies (i.e. all species regulated under the Multispecies FMP except silver hake, red hake, ocean pout, and Atlantic halibut) ranged from a high of 8.0 million in 1991 to a low of 2.8 million fish in 1999. Regulated multispecies contributed to less than 6.5% of the total recreational catch and 8% of total mortality from 1990 to 2001 (Table 524). As the total catch of all species and groundfish catch has declined so has the relative importance of regulated groundfish as a percentage of the Northeast recreational fishery. Specifically, the percentage of groundfish in total catch averaged 4.4% from 1990 to 1995 but fell to 3.0% from 1995 to 2001. This decrease in percentage of total catch was accompanied by a decline in groundfish as a percentage of total mortality. These effects may be due to a combination of factors affecting species targeting choices, including shifts in stock status (improvements in resource conditions for popular recreational species like striped bass and summer flounder with relatively poorer stock conditions for groundfish) as well as regulatory changes affecting groundfish including size and bag limits with the implementation of Amendment 7.

Year	Total Catch	Total Mortality	Total Groundfish Catch	Total Groundfish Mortality	Groundfish Percent of Total Catch	Groundfish Percent of Total Mortality
1990	121.1	65.7	7.8	5.2	6.4%	7.9%
1991	167.8	84.1	8.0	5.1	4.8%	6.1%
1992	109.1	55.8	2.7	1.6	2.4%	2.8%
1993	135.4	61.2	6.9	3.9	5.1%	6.4%
1994	147.6	69.6	5.2	2.7	3.6%	3.8%
1995	130.1	53.6	5.4	2.9	4.1%	5.3%
1996	120.5	47.3	4.5	2.5	3.7%	5.3%
1997	146.2	57.4	3.6	1.9	2.5%	3.4%
1998	125.8	43.5	2.9	1.4	2.3%	3.1%
1999	125.9	40.0	2.8	1.3	2.2%	3.4%
2000	189.5	73.6	5.7	2.8	3.0%	3.8%
2001	171.9	58.6	5.5	2.6	3.2%	4.4%
'90-'95 Avg.	135.2	65.0	6.0	3.5	4.4%	5.4%
'95-'01 Avg.	144.3	53.4	4.3	2.2	3.0%	4.1%

Table 524 - Total recreational catch and mortality of combined species and regulated groundfish in the Northeast Region.
Source Data: MRFSS database. Years denote calendar years. Catch and landings are expressed in millions of fish.

Although the proportion of groundfish catch has declined on a region-wide basis, there are important differences in the relative importance of groundfish across sub-regions and modes. As a percent of the total groundfish catch, a small majority of fish is caught by anglers in New England states (Table 525). This majority has increased slightly in terms of both catch and mortality averaging 63.2% and 58.1% respectively from 1995-2001 as compared to 53.6% and 54.0% from 1990-1995. Note that groundfish catch by Mid-Atlantic anglers comes almost exclusively from New York and New Jersey anglers.

Though New England catches represent a small majority of recreationally caught groundfish, the proportion of groundfish in New England recreational catch is greater than that in Mid-Atlantic fisheries. From 1990 to 1995 the share of groundfish in the New England catch ranged between 23.4% and 7.6%, averaging 14.6% (Table 525). In contrast, the share of groundfish in Mid-Atlantic angler catches averaged only 3.1% over the same time period. Since 1995, the proportion of groundfish in both New England and Mid-Atlantic fisheries has declined, averaging 12.2% and 1.4% respectively. This decline is most pronounced beginning in 1996, which coincides with a period of relatively depressed stock conditions as well as implementation of more restrictive measures under Amendment 7 of the Multispecies FMP. However, the share of groundfish in New England recreational fisheries increased in three consecutive years (1999-2001) so the relative share of groundfish in New England recreational may once again approach levels experienced in the early 1990's. Note the share of groundfish in total mortality in both regions follows the same general pattern described for total catch.

Year	New England Share of Northeast Region Groundfish Catch	New England Share of Northeast Region Groundfish Mortality	New England Groundfish Catch as a % of Total Catch	New England Groundfish Mortality as a % of Total Mortality	Mid-Atlantic Groundfish Catch as a % of Total Catch	Mid-Atlantic Groundfish Mortality as a % of Total Mortality
1990	55.9%	61.2%	23.4%	24.6%	3.4%	3.8%
1991	43.9%	48.0%	13.2%	13.3%	3.2%	4.1%
1992	50.9%	53.8%	7.6%	7.7%	1.4%	1.6%
1993	49.5%	48.6%	16.3%	14.3%	3.1%	4.2%
1994	59.7%	57.6%	12.1%	9.0%	1.7%	2.2%
1995	61.4%	54.7%	15.0%	15.6%	1.9%	3.0%
1996	44.3%	41.4%	8.7%	11.0%	2.6%	3.9%
1997	54.4%	49.9%	8.1%	10.3%	1.4%	2.0%
1998	76.9%	80.3%	9.6%	16.0%	0.7%	0.7%
1999	67.7%	61.3%	8.2%	9.4%	0.9%	1.7%
2000	63.1%	50.0%	9.4%	8.1%	1.3%	2.4%
2001	74.5%	69.2%	12.3%	14.8%	1.0%	1.7%
'90-'95 Avg.	53.6%	54.0%	14.6%	14.1%	2.4%	3.1%
'95-'01 Avg.	63.2%	58.1%	10.2%	12.2%	1.4%	2.2%

Table 525 - Distribution of groundfish catch by sub-region. 1990-2001.
Source Data: MRFSS database. Years denote calendar years. Catch and landings are expressed in millions of fish.

There are only small differences in the relative importance of recreationally caught groundfish across all modes in the Mid-Atlantic sub-region (Table 526). Across all modes, the relative contribution of groundfish in Mid-Atlantic angler catches averaged between 2.0% and 3.5% from 1990 to 1995 and averaged 1.5% or less from 1995 to 2001. The relative contribution of groundfish to the total catch among shore-based anglers in New England was similar to that for Mid-Atlantic anglers. In contrast, a greater proportion of groundfish was present in private boat catches in New England. Groundfish represented at least one-third of New England party/charter catches in all but two years since 1990. Further, compared to the 1990-1995 time period, while the average proportion of groundfish to total catch declined in both regions for private and shore modes and in the Mid-Atlantic party/charter mode, the contribution of groundfish in the New England party/charter mode increased from 37.8% to 41.6%.

	New England by Mode			Mid-Atlantic by Mode		
Year	**Shore**	**Party/Charter**	**Private Boat**	**Shore**	**Party/Charter**	**Private Boat**
1990	10.1%	44.3%	22.1%	3.9%	3.9%	3.1%
1991	3.2%	29.1%	13.2%	2.6%	5.4%	3.0%
1992	3.0%	25.9%	7.3%	1.9%	2.6%	1.1%
1993	5.7%	39.5%	12.7%	2.2%	4.0%	3.1%
1994	2.0%	35.4%	13.9%	1.0%	1.7%	2.1%
1995	3.4%	53.0%	9.5%	0.7%	2.0%	2.4%
1996	3.6%	34.3%	6.5%	4.6%	1.9%	2.0%
1997	3.4%	38.5%	5.4%	0.8%	1.1%	1.6%
1998	2.0%	52.3%	7.4%	0.9%	1.4%	0.5%
1999	3.8%	33.5%	6.6%	0.9%	0.7%	0.9%
2000	2.3%	34.2%	7.7%	0.9%	1.6%	1.2%
2001	1.5%	45.5%	12.3%	1.2%	0.4%	0.9%
1990-1995 Average	4.6%	37.8%	13.1%	2.0%	3.3%	2.5%
1995-2001 Average	2.8%	41.6%	7.9%	1.4%	1.3%	1.4%

Table 526 - Proportion of recreational groundfish catch by mode and sub-region. 1990-2001.
Source Data: MRFSS database. Years denote calendar years. Catch and landings are expressed in numbers of fish.

9.4.3.3 Party/Charter Fisheries

As described earlier, information about the party/charter sector is gathered by both the MRFSS and by a logbook program for vessels that take passengers for hire that retain species that are covered under a Federal FMP requiring mandatory reporting. There are important differences between the two reporting systems that must be considered in drawing inferences about the status of the party/charter fishery and its participants.

The MRFSS is broad-based and surveys individual anglers regarding all forms of party/charter activity regardless of fishing location or species caught. In contrast, logbook data represent a census of party/charter vessel activity but is limited only to those vessels holding Federal permits requiring mandatory reporting. Therefore, the logbooks do not record party/charter vessel activity in state waters or for those targeting unregulated species. However, for the segment of the party/charter fishery that is covered by logbooks, the coverage of party/charter catch is more comprehensive than the MRFSS. This is particularly true for species that are encountered infrequently in the MRFSS intercept survey. Given that the sample size for the party/charter sector in the MRFSS is low relative to shore and private boat sampling, less frequently caught species are likely to be absent from survey data or present in very low numbers. Consequently, catch estimates can be influenced by outliers or “unusual” trips, may not be reliable due to large standard errors, and often cannot be sufficiently disaggregated by location to address issues of concern to fisheries managers. As a census of activity, logbooks overcome many of these problems but are subject to their own potential difficulties.

Logbook data is subject to human error when initially recorded by hand and later electronically recorded into a database. For party/charter trips the captain is required to report time and date sailed/returned, number of anglers, number of crew, gear used, statistical area fished, loran or latitude-longitude coordinates, and kept and discarded catch in numbers of fish by species. If properly documented, these data can provide important information about the party/charter fishery that the MRFSS cannot. For example, the number of operating vessels can be identified along with information on numbers of trips by trip type (half-day, full-day, overnight), area fished, numbers of passengers carried, etc. However, inaccuracies in reporting may misrepresent certain facets of the party/charter fishery. To date, the most common recording errors that have been identified are reporting fish in pounds instead of numbers, failing to report loran or latitude-longitude coordinates, failing to report numbers of passengers, incorrectly recording trip type, and failure to report time sailed or returned. Of these errors, the most problematic is reporting catch in pounds instead of numbers.

In addition to potential errors in properly filling out each logbook, there may also be inaccuracies (accidental or otherwise) in the information that has been provided. Unfortunately, unlike the commercial fisheries dealer reporting system there is no independent cross-check to verify the validity of the reported data except for the MRFSS which is itself less reliable for the party/charter mode than for other modes. To date, no thorough review of the party/charter logbooks has been conducted to determine error rates either in terms of missing or inaccurate information or coding errors. This means it is not possible to identify potential biases present in the party/charter logbook data other than obvious outliers. There is no particular reason to believe that the party/charter logbooks are subject to any more or less error than commercial logbooks. They are likely to provide a reasonable approximation of party/charter activity and should be a reliable indicator of trends in the party/charter fishery.

9.4.3.3.1 Party/Charter Permits

As of fishing year 2002, Federal party/charter permits were issued under the following FMPs: Summer Flounder/Scup/Black Sea Bass, Squid/Mackerel/Butterfish, Lobster, Bluefish, and Multispecies. Each of these permit categories is open access and may require mandatory reporting. With the exception of the Multispecies plan any vessel carrying passengers for hire must have a party/charter permit. Since the Multispecies plan forbids any vessel from having a limited access and any open access permits, limited access vessels may carry passengers for hire without having a specific party/charter permit to do so. In 1995 there were a total of 990 unique vessels (Table 527). In 1996 a total of 413 multispecies party/charter permits were issued, this number increased to 610 permits in fishing year 2000 and was about 650 permits in 2001 and 2002. The total number of unique vessels that were issued at least one party charter permit ranged from a high of 964 in 2000 to a low of 752 in 1998.

9.4.3.3.2 Party/Charter Trip Activity

Party/Charter vessels typically offer a range of trip types but most common are half-day, full-day, and extended or overnight trips. Using the logbook data a half-day trip was defined as any trip of 6 hours or fewer, a full-day trip was defined as a trip between 6 and 12 hours and trips in excess of 12 hours were defined as an extended trip. Extended trips may include trips that may be considered as being an “overnight” trip because they may be 24 hours or greater in duration or may span more than one calendar day. Note that an extended trip that was 18 hours but departed and returned on the same calendar day would not be considered an overnight trip under these criteria.

The total number of extended trips taken by Mid-Atlantic party/charter operators was much greater than that of Gulf of Maine operators (Table 528). However, the proportion of extended relative to total trips was similar in both areas with the Gulf of Maine generally one to two percentage points below that of the Mid-Atlantic. The proportion of overnight trips relative to total extended trips ranged between 25.2% and 30.5% from 1995 to 1999 in the Mid-Atlantic but increased to nearly 50% in 2001. By contrast, the relative proportion of overnight trips in the Gulf of Maine has never been more than 14.4% and averaged below 6% from 1996 – 2000 before increasing to almost 13% in 2001. Unlike the Mid-Atlantic region, groundfish and more specifically, cod were retained on the majority of overnight trips in the Gulf of Maine. In the Mid-Atlantic region, groundfish was retained on fewer than 10% of overnight trips.

Permit Type	1995	1996	1997	1998	1999	2000	2001	2002
Summer Flounder	774	645	585	579	619	674	691	670
Lobster	37	37	40	36	40	28	20	23
Squid/Mackerel/Butterfish	821	752	570	517	542	600	610	605
Multispecies	N/A	413	499	493	526	610	652	647
Black Sea Bass	N/A	N/A	306	437	501	593	629	623
Scup	N/A	N/A	419	425	472	556	577	576
Bluefish	N/A	N/A	N/A	N/A	N/A	756	794	763
Total Unique Permitted Vessels	990	955	849	752	796	964	962	909

Table 527 - Summary of northeast region party/charter permits. 1995-2002.
Source Data: NMFS Permit database. Years denote permit years.

	1995	1996	1997	1998	1999	2000	2001
Georges Bank/Mid-Atlantic							
Total Trips	20460	22326	22687	22403	21132	24105	24358
Total Extended Trips	2360	2264	2352	1994	1718	1397	1215
Total Overnight Trips	719	576	593	541	460	586	585
Total Overnight Groundfish Trips	63	88	45	27	36	28	53
Total Overnight Cod Trips	54	75	38	27	33	24	36
Gulf of Maine							
Total Trips	4022	4171	4053	3883	3823	4840	5693
Total Extended Trips	390	365	360	328	271	229	183
Total Overnight Trips	56	45	15	15	15	18	23
Total Overnight Groundfish Trips	44	34	8	8	12	11	18
Total Overnight Cod Trips	43	33	8	8	12	10	18

Table 528 - Summary of northeast region overnight party/charter trips. 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

The number of reporting vessels ranged from 512 in 1998 to 623 in 1995 (Table 529). Note that the number of reporting operators may be influenced by a combination of changing activity levels and changes in the number of permitted vessels that have been subject to mandatory reporting. Total trips and passengers were all higher in 2001 than in any other year while the largest number of fish kept was 4.5 million in 1995. On a per trip basis, fishing year 2001 was within the range of recent historical activity in terms of passengers and numbers of fish retained. Similarly the average keep per passenger was also consistent with levels experienced over the prior six years. The distribution of activity by trip length has been relatively stable with a slight redistribution of activity away from “overnight” trips to shorter trips since 1998. Across types of trips, half-day trips tended to retain fewer fish. Keep rates per passenger were also lowest on half-day trips.

	1995	1996	1997	1998	1999	2000	2001
Number of Reporting Vessels	623	576	551	512	542	573	606
Total Trips	24,481	26,496	26,739	26,285	24,954	28,944	30,050
Total Passengers	472,484	495,555	520,953	506,667	471,382	553,855	580,367
Total Keep	4,525,316	3,712,876	3,559,795	3,007,877	3,047,006	3,947,500	4,072,223
Passengers per Trip	19.3	18.7	19.5	19.3	18.9	19.1	19.3
Keep per Trip	184.9	140.1	133.1	114.4	122.1	136.4	135.5
Keep per Passenger	9.6	7.5	6.8	5.9	6.5	7.1	7.0
Half-Day Trips (6 hours of less)							
Total Trips	7,416	8,143	7,823	8,652	8,226	8,303	7,971
Total Passengers	138,666	154,124	151,852	173,457	162,541	174,565	169,301
Total Keep	498,049	632,144	508,043	525,413	563,777	653,467	532,518
Passengers per Trip	18.7	18.9	19.4	20.0	19.8	21.0	21.2
Keep per Trip	67.2	77.6	64.9	60.7	68.5	78.7	66.8
Keep per Passenger	3.6	4.1	3.3	3.0	3.5	3.7	3.1
Full-Day Trips (more than 6 up to 12 hours)							
Total Trips	14,315	15,724	16,204	15,311	14,739	19,015	20,681
Total Passengers	282,783	295,322	317,635	292,533	276,744	353,727	391,134
Total Keep	3,573,270	2,648,984	2,682,318	2,229,411	2,197,896	3,075,009	3,361,106
Passengers per Trip	19.8	18.8	19.6	19.1	18.8	18.6	18.9
Keep per Trip	249.6	168.5	165.5	145.6	149.1	161.7	162.5
Keep per Passenger	12.6	9.0	8.4	7.6	7.9	8.7	8.6
Extended Trips (more than 12 hours)							
Total Trips	2,750	2,629	2,712	2,322	1,989	1,626	1,398
Total Passengers	51,035	46,109	51,466	40,677	32,097	25,563	19,923
Total Keep	453,997	431,748	369,434	253,053	285,333	219,024	178,599
Passengers per Trip	18.6	17.5	19.0	17.5	16.1	15.7	14.3
Keep per Trip	165.1	164.2	136.2	109.0	143.5	134.7	127.8
Keep per Passenger	8.9	9.4	7.2	6.2	8.9	8.6	9.0

Table 529 - Summary of party/charter activity for vessels reporting taking passengers for hire 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30. Keep is expressed in numbers of fish.

In any given year, approximately half of the party/charter vessels operating in the Northeast Region report catching and keeping at least some number of regulated multispecies. Since 1995, the total number of these reporting vessels has ranged between 251 and 309 (Table 530). On average, aggregate numbers of passengers taken, trips, combined keep of all species, and groundfish keep were lower in 1998-1999 as compared to 1995-1997, although keep and passengers per trip as well as keep per passenger has remained relatively constant over the past six years.

Over the past two fishing years (2000 and 2001) total trips, passengers and groundfish keep has increased but as just noted, neither per trip nor per passenger keep rates have changed much in seven years.

The total number of extended trips reporting keeping groundfish declined four consecutive years since 1996 but was stable in fishing years 2000 and 2001. The number of half-day trips had also been declining since 1996 but increased my more than 200 trips from 2000 to 2001. The number of full-day trips had remained relatively constant at about 3,000 trips per year before increasing by 800 and 700 trips in fishing years 2000 and 2001 respectively. With the exception of half-day trips in 2001, the number of passengers per trip was similar across all trip types ranging from 19 to 25 passengers over the seven year period. Unlike the Northeast region as a whole, where there was little difference in keep per trip or keep per passenger between full-day and extended trips, there were substantial differences in keep rates for party/charter vessels landing groundfish particularly since 1998. Specifically, the groundfish keep per trip for full-day trips is more then twice that of half-day trips and in many years more than doubles again for overnight trips. Similarly, groundfish keep per passenger was only slightly more than one fish from 1996-2001 on half-day trips, but was almost 4 fish on full day trips in 2000 and 2001, and exceeded 10 fish on overnight trips in 2001.

	1995	1996	1997	1998	1999	2000	2001
Reporting Vessels	301	309	272	251	255	257	290
Total Trips	4,468	4,963	4,280	4,005	3,834	4,458	5401
Total Passengers	101,043	109,074	92,081	87,718	84,859	95,949	130222
Total Keep	600,042	744,225	647,776	525,829	497,278	635,865	754070
Groundfish Keep	367,086	377,478	293,804	268,222	263,726	357,313	459917
Passengers per Trip	22.6	22.0	21.5	21.9	22.1	21.5	24.1
Keep per Trip	134.3	150.0	151.3	131.3	129.7	142.6	139.6
Groundfish Keep per Trip	82.2	76.1	68.6	67.0	68.8	80.2	85.2
Keep per Passenger	5.9	6.8	7.0	6.0	5.9	6.6	5.8
Groundfish Keep per Passenger	3.6	3.5	3.2	3.1	3.1	3.7	3.5
Half-Day Trips							
Total Trips	1019	1175	812	662	687	598	818
Total Passengers	19,792	25,496	16,740	15,946	17,197	15,573	25160
Total Keep	84,156	90,030	38,115	35,569	39,989	36,618	42330
Groundfish Keep	51,590	43,444	21,681	16,100	19,062	15,839	15976
Passengers per Trip	19.4	21.7	20.6	24.1	25.0	26.0	30.8
Keep per Trip	82.6	76.6	46.9	53.7	58.2	61.2	51.7
Groundfish per Trip	50.6	37.0	26.7	24.3	27.7	26.5	19.5
Keep per Passenger	4.3	3.5	2.3	2.2	2.3	2.4	1.7
Groundfish Keep per Passenger	2.6	1.7	1.3	1.0	1.1	1.0	0.6
Full-Day Trips							
Total Trips	2895	3105	2924	2858	2758	3570	4288
Total Passengers	67,388	67,111	63,179	61,235	59,703	73,247	98365
Total Keep	366,219	442,416	472,264	382,333	367,094	499,540	596600
Groundfish Keep	51,590	186,652	174,603	191,489	192,509	293,553	373808
Passengers per Trip	23.3	21.6	21.6	21.4	21.6	20.5	22.9
Keep per Trip	126.5	142.5	161.5	133.8	133.1	139.9	139.1
Groundfish Keep per Trip	17.8	60.1	59.7	67.0	69.8	82.2	87.2
Keep per Passenger	5.4	6.6	7.5	6.2	6.1	6.8	6.1
Groundfish Keep per Passenger	0.8	2.8	2.8	3.1	3.2	4.0	3.8
Extended Trips							
Total Trips	554	683	544	485	389	290	295
Total Passengers	13,863	16,467	12,162	10,357	7,959	7,129	6695
Total Keep	149,667	211,779	137,397	107,927	90,195	99,707	115140
Groundfish Keep	113,117	147,382	97,520	60,633	52,155	47,921	70133
Passengers per Trip	25.0	24.1	22.4	21.4	20.5	24.6	22.7
Keep per Trip	270.2	310.1	252.6	222.5	231.9	343.8	390.3
Groundfish Keep per Trip	204.2	215.8	179.3	125.0	134.1	165.2	237.7
Keep per Passenger	10.8	12.9	11.3	10.4	11.3	14.0	17.2
Groundfish Keep per Passenger	8.2	9.0	8.0	5.9	6.6	6.7	10.5

Table 530 - Summary of party/charter activity for vessels reporting groundfish catch 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30. Keep is expressed in numbers of fish.

9.4.3.3.3 Composition of Party/Charter Catch

Party/charter vessels in the Northeast region target a variety of different species. The top five federally regulated species kept by vessels operating out of New England are cod, scup, bluefish, pollock, and haddock (Figure 307). Of these species, the proportional keep of cod had been declining since 1996 but increased in both 2000 and 2001. The relative proportion of Scup keep had also been declining but has been increasing every year since 1998. For vessels operating out of Mid-Atlantic ports, the top five species are black sea bass, bluefish, scup, summer flounder, and striped bass (Figure 308). While groundfish species comprise 40% or more of total kept catch in New England, groundfish tends to be less than 1% of total kept catch for Mid-Atlantic party/charter vessels. Of the groundfish species most frequently kept cod, haddock and pollock represent nearly 98% of total kept catch (Figure 309).

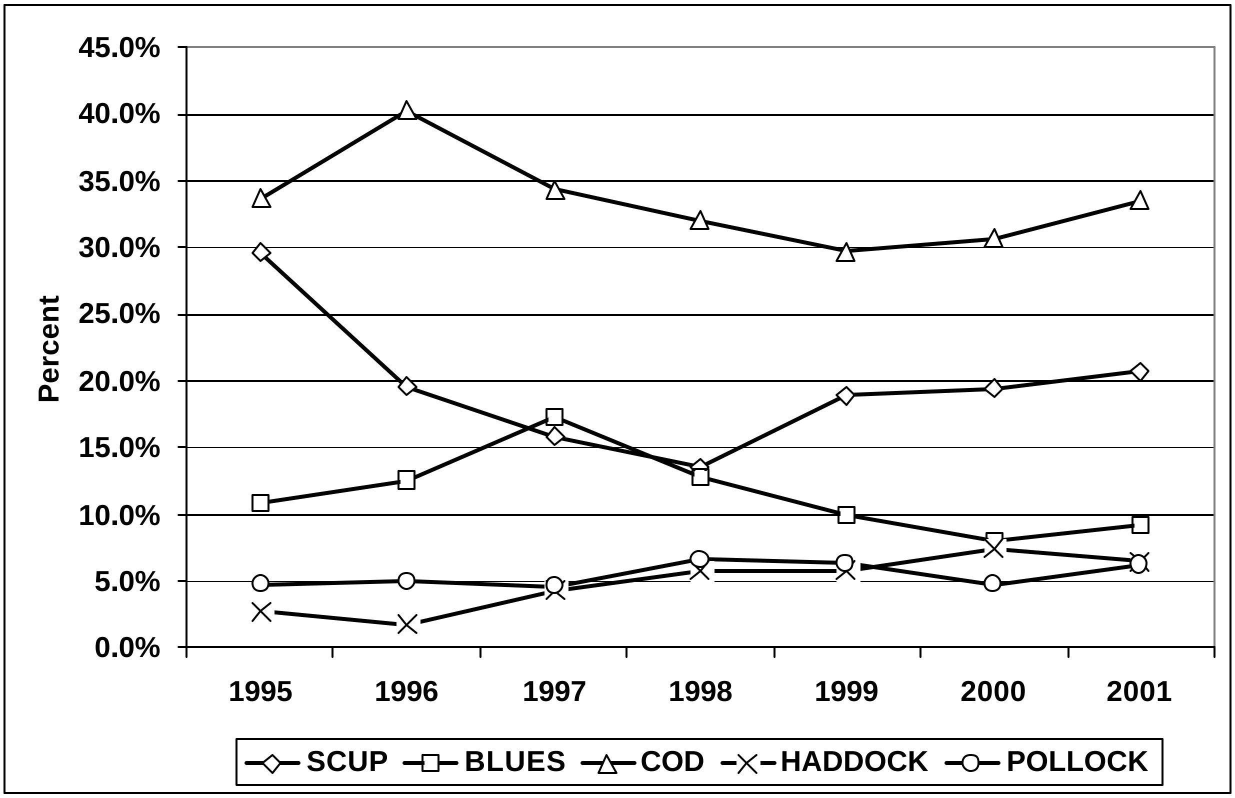


Figure 307 - Composition of top-five regulated species kept by New England party/charter vessels. 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

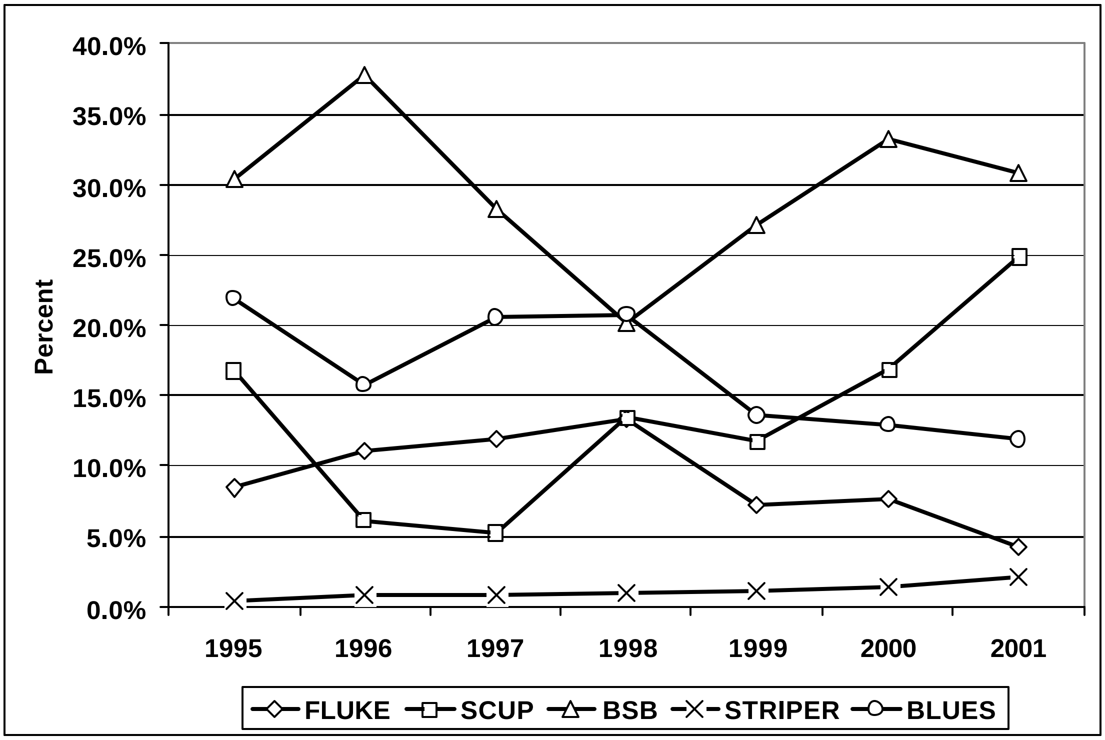


Figure 308 - Composition of top-five regulated species kept by Mid-Atlantic party/charter vessels. 1995-2001. ***Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.***

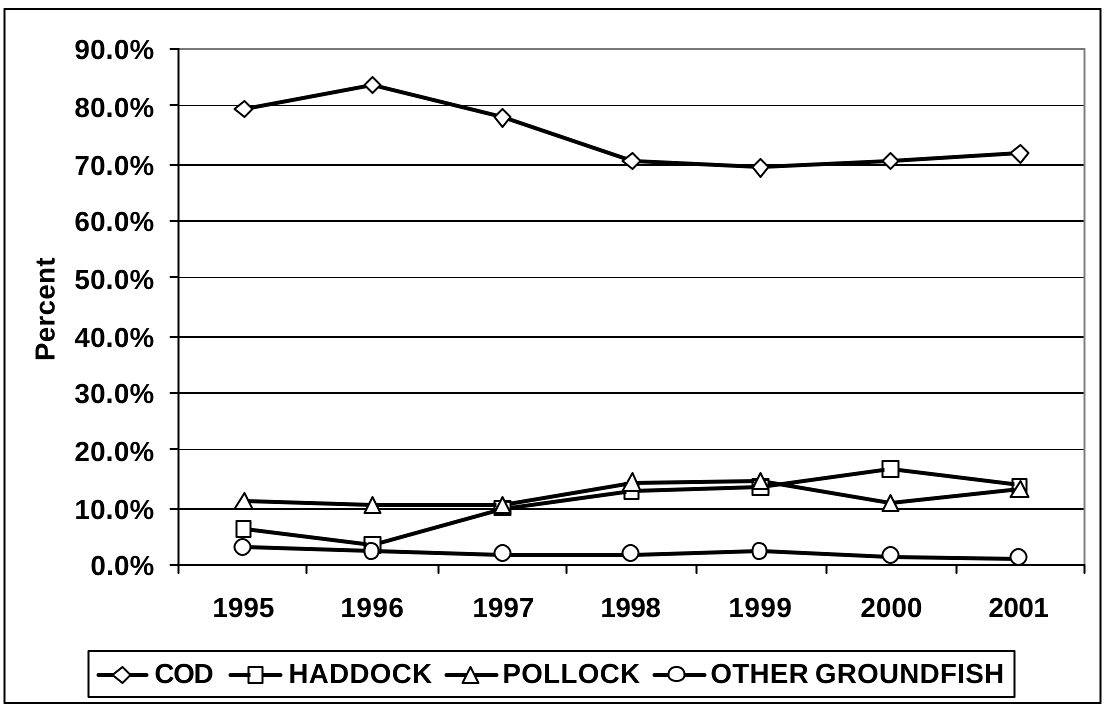


Figure 309 - Composition of groundfish species kept by New England party/charter vessels. 1995-2001. ***Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.***

9.4.3.3.4 Party/Charter Vessel Dependence on Passenger Income

In the Northeast, Party/Charter vessels may elect to take passengers for hire or, provided they possess appropriate permits, may elect to fish commercially. Total annual income was estimated by adding all commercial gross revenues as reported in the dealer data with total income from passenger fees. Passenger fees by state were estimated as the average reported party/charter fee by anglers interviewed during the 1998 Northeast region angler expenditure survey (Steinback and Gentner 2001). Party/charter vessels also receive income from equipment rental and sales of food and merchandise. Therefore, the total income of a given party/charter business may be underestimated.

The majority (an average of 78%) of party/charter vessels operating in the Northeast region depend exclusively on passenger fees for total operating revenues (Table 531). Since 1995, there have been no notable changes in the relative proportion of vessels that may have switched from commercial activity to carrying passengers for hire. On average, 7.4% of party/charter vessels relied on passenger fees for 25% or less of total business income.

	= 25%	25% < I = 50%	50%< I = 75%	75% < I < 100%	100%
1995	10.0%	2.9%	1.4%	9.0%	76.7%
1996	6.4%	1.7%	4.2%	8.2%	79.5%
1997	7.4%	1.6%	4.4%	10.0%	76.6%
1998	6.1%	3.3%	3.9%	9.4%	77.3%
1999	7.7%	2.2%	3.0%	10.7%	76.4%
2000	6.3%	1.9%	1.6%	10.8%	79.4%
2001	7.9%	1.8%	1.5%	10.9%	77.9%

Table 531 - Proportion of total income from party/charter business (all vessels). 1995-2001.
Source Data: NMFS Dealer database. Years denote fishing years – May 1 to April 30.

For party/charter vessels that kept some quantity of groundfish income dependence on passenger fees was only slightly less than that for Northeast Region party/charter operators (Table 532).

	= 25%	25% < I = 50%	50%< I = 75%	75% < I < 100%	100%
1995	9.0%	3.0%	1.7%	11.6%	74.8%
1996	5.5%	2.9%	4.2%	11.3%	76.1%
1997	9.6%	1.5%	5.9%	14.3%	68.8%
1998	5.6%	3.2%	6.4%	12.7%	72.1%
1999	9.8%	3.1%	3.5%	14.1%	76.4%
2000	6.2%	2.3%	1.9%	14.0%	75.5%
2001	6.2%	2.4%	1.4%	13.4%	76.6%

Table 532 - Proportion of total income from party/charter business (vessels reporting groundfish catch), 1995-2001.
Source Data: NMFS Dealer database. Years denote fishing years – May 1 to April 30.

9.4.3.3.5 Party/Charter Ports or "Centers of Activity"

McCay et. al. (1999) and McCay, O'Neil and Velcheck (1999) identify several ports in New Jersey and New York as places where party/charter vessels are concentrated. Party/charter vessels that reported keeping some groundfish were from ports in New England, New York and New Jersey (Table 533). The majority of these vessels operate out of Massachusetts, Maine, Rhode Island and New Hampshire. Since 1996 there has been a contraction in the number of party/charter vessels from Connecticut, New York, and New Jersey that either targeted or encountered groundfish. The number of ports in Connecticut, New York and New Jersey in which party/charter vessels are located has also decreased (Table 534). The number of ports in which party/charter vessels that land groundfish are located has remained relatively stable in Maine, New Hampshire, Massachusetts, and Rhode Island and has declined in Connecticut.

	1995	1996	1997	1998	1999	2000	2001
Maine	25	28	21	19	19	17	21
New Hampshire	22	21	19	19	21	22	29
Massachusetts	70	73	74	68	76	87	107
Rhode Island	32	34	24	25	28	26	24
Connecticut	15	12	5	3	5	7	8
New York	68	64	55	46	52	45	43
New Jersey	60	70	59	52	39	41	45
Other	9	7	13	19	15	12	13

Table 533 - Number of groundfish party/charter boats reporting taking passengers for hire. 1995-2000.

Source Data: NMFS Permit database. Years denote fishing years – May 1 to April 30.

	1995	1996	1997	1998	1999	2000	2001
Maine	12	14	14	11	12	13	15
New Hampshire	6	6	5	4	4	5	7
Massachusetts	19	21	24	19	23	25	31
Rhode Island	11	12	9	7	8	8	7
Connecticut	6	7	4	3	3	6	6
New York	15	16	16	10	12	12	12
New Jersey	19	19	18	16	15	13	13

Table 534 - Number of ports with one or more groundfish reporting party/charter boats. 1995-2000.

Source Data: NMFS Permit and VTR databases. Years denote fishing years – May 1 to April 30.

There were only 12 ports (defined by principal port on the annual permit application) in the Northeast that have maintained a party/charter fleet (defined as 4 or more vessels) that reported landing groundfish while taking passengers for hire in every year from 1995 to 2001(Table 535). There were no ports in Maine or Connecticut that met this criterion and only one port in Rhode Island (Point Judith), New Hampshire

(Hampton) and New York (Montauk). Only Massachusetts (Gloucester, Green Harbor, Newburyport, Plymouth, and Salisbury) and New Jersey (Atlantic Highlands, Barnegat Light, Belmar, and Point Pleasant) had more than one port with four or more party/charter operators in every year.

	1995	1996	1997	1998	1999	2000	2001
MAINE							
Boothbay Harbor	5	2	2	1	2	3	2
Kennebunkport	1	4	1	2	0	0	2
Kittery	2	5	3	2	2	2	2
Ogunquit	0	2	2	3	4	1	1
Portland	5	3	1	3	1	1	2
York Harbor	3	3	2	2	2	1	1
NEW HAMPSHIRE							
Hampton	8	10	8	9	9	11	10
Portsmouth	4	2	4	5	5	6	10
Rye	4	3	2	3	4	3	2
Seabrook	4	4	4	2	3	1	3
MASSACHUSETTS							
Boston	1	3	1	0	1	3	5
Chatham	4	1	2	1	1	1	3
Gloucester	11	14	14	13	15	18	23
Green Harbor	13	12	14	16	14	15	12
Harwich	2	4	5	2	2	1	4
Marshfield	0	0	2	3	7	4	4
Newburyport	10	9	4	6	6	8	8
Plymouth	6	5	5	4	5	7	6
Salisbury	5	5	9	6	7	6	8
Scituate	5	3	4	3	3	3	4
RHODE ISLAND							
Galilee	6	5	3	5	5	4	4
Narragansett	3	4	2	3	4	2	3
Point Judith	11	14	13	12	12	10	10
Snug Harbor	3	3	0	2	3	6	4
NEW YORK							
Brooklyn	7	6	5	5	3	2	3
Captree	8	6	4	3	2	0	1
Freeport	5	3	2	1	1	2	4
Montauk	31	32	30	26	33	27	25
NEW JERSEY							
Atlantic Highlands	6	8	9	7	8	6	5
Barnegat Light	9	10	10	10	5	7	6
Belmar	9	11	10	8	4	6	9
Brielle	5	5	6	4	3	3	7
Point Pleasant	9	10	4	9	5	7	8

Table 535 - Number of groundfish party/charter vessels by selected port. 1995-2001.
Source Data: NMFS Permit and VTR database. Years denote fishing years – May 1 to April 30.

9.4.3.3.6 Effectiveness of Management Regulations (1997-2001)

With the implementation of Amendment 7 a bag limit of 10 fish of combined cod and haddock was established and the recreational size limit for cod and haddock was increased from 19 to 21 inches over two years. Although the size limit applied to all recreational anglers, only private boats and shore anglers are subject to the bag limits. Beginning in fishing year 2000, party/charter vessels were required to obtain a letter of authorization to fish in any one of the GOM closed areas or the Nantucket Lightship closure. Note that these regulations apply to Atlantic cod and haddock while fishing in Federal waters. Fish harvested from state waters are subject to state regulations that may or may not be in conformance with Federal laws so that evaluation of the effectiveness of Federal regulations is clouded by these inconsistencies. Thus, the following was developed in terms of conformance with Federal regulations since non-compliance is not readily discernible.

To evaluate the effectiveness of recreational measures established in Amendment 7, the kept catch and size distributions by stock area and mode were constructed from MRFSS data. Due to the relatively infrequent sampling of haddock catch, only size distributions for Atlantic cod were constructed. Kept catch distributions for cod were based on expanded estimates from the raw MRFSS intercept data and were modified to account for portions of kept catch that were filleted. The latter adjustment was necessary because filleted catch is usually treated as discards (or Type B1 catch) under MRFSS reporting procedures. Given the fact that filleting fish is one of the services that many party/charter operators offer their customers, omission of filleted catch would misrepresent the actual party/charter kept catch.

Although both numbers and length of cod are recorded as part of the intercept survey the available sample size for fish lengths is smaller than the sample size for numbers of cod. Length measurements are not always taken at the time fish are counted for a variety of reasons. Filleted fish are not measured. Anglers may permit the interviewer to count fish but may refuse to allow the interviewer to take biological samples (weight and length measurements). In other instances the interviewer may not take biological samples because of time constraints at a particularly busy site.

For the reasons outlined above, in combination with a general decline in recreational catches there have not been sufficient length samples in any fishing mode to construct a size distribution for Georges Bank cod in any year since 1998. For the private boat mode there have not been enough measured fish to estimate a size distribution of the Georges Bank cod catch sine 1996. Thus, an assessment of conformance with the Amendment 7 Georges Bank cod size regulations is not possible.

Size limit conformance in the Gulf of Maine differs markedly between recreational fishing modes. On average, about 9% of party charter kept cod was not in conformance with Federal size regulations in effect (19”) from 1993 to 1996 (Figure 310). From 1997 to 2000 less than 4% of cod kept by party/charter passengers was below the Federal size limit (20” in 1997 and 21” thereafter) but was 16% in calendar year 2001. Compared to the 1993-1996 average non-conformance rate, the average rate since implementation of Amendment 7 has improved to 6% or equivalently, 94% of cod retained by party/charter anglers has been at or above the Federal size limit.

By contrast, 23% of the private boat kept cod was not in conformance with the Federal size limit prior to Amendment 7 and was at least that much in 1997, 1999, and 2000 (Figure 311). The non-conformance rate was about 8% and 10% in 1998 and 2001 respectively. Compared to the 1993-96 average, the 1997-2001 average non-conformance rate improved to about 19%; still more than three times as great as that of party/charter anglers.

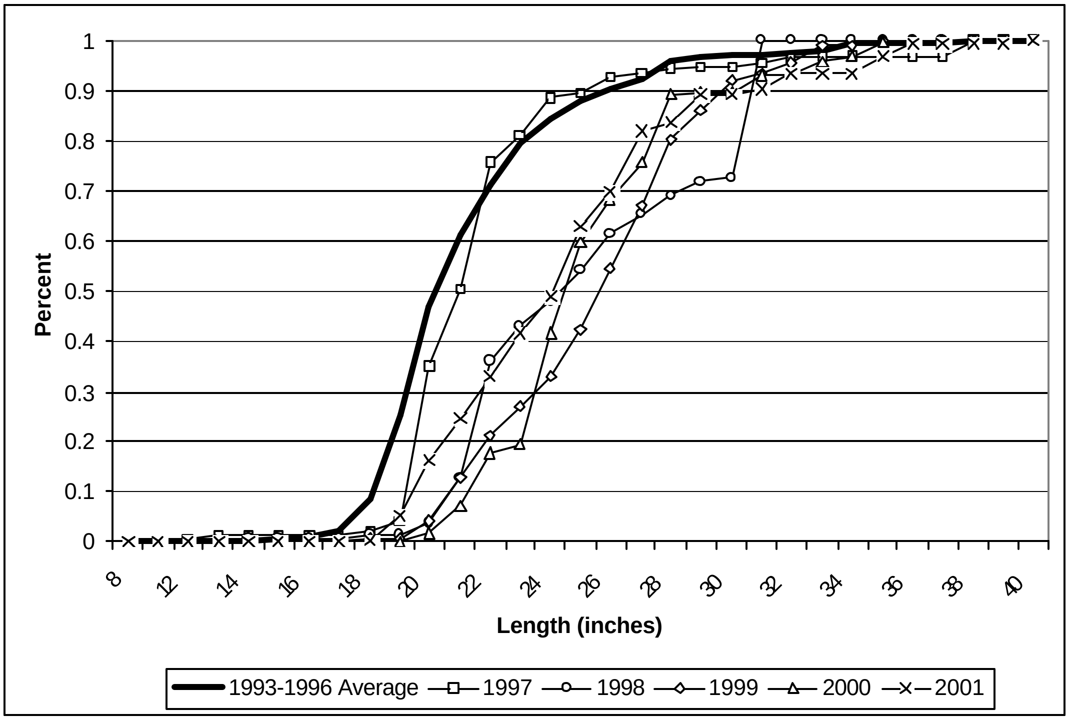


Figure 310 - Cumulative percent of Gulf of Maine cod kept by size class for party/charter mode. 1993-2001.
Source Data: NMFS MRFSS database. Years denote calendar years.

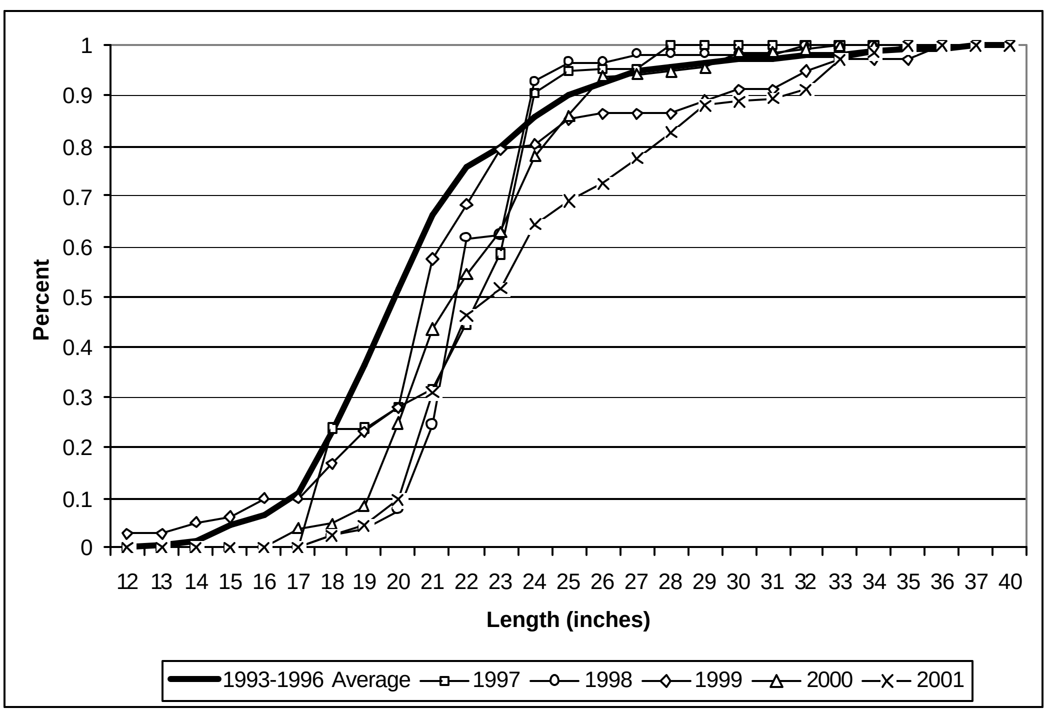


Figure 311- Cumulative percent of Gulf of Maine cod kept by size class for private boat. 1993-2001.
Source Data: NMFS MRFSS database. Years denote calendar years.

Due to low sample sizes for Georges Bank cod in the private boat mode the effectiveness of the cod trip limit is difficult to assess. However, on average, 21% of total Georges Bank cod was retained from 1993 to 1996. Available data indicate that the proportion of Georges Bank cod retained above the 10 fish limit has likely declined but it is not possible to determine whether this improvement may be due to compliance or to declining stock conditions.

Conformance by Gulf of Maine private boat anglers has resulted in a decline in the proportion of retained fish in excess of the 10 fish bag limit (Figure 312). From 1993 to 1996 approximately 33% of cod was retained on trips where more than 10 fish were kept. From 1997 to 1999 less than 4% of cod was on trips that kept more than 10 fish. In both 2000 and 2001 proportionally more fish were retained above the bag limit (12% and 18% respectively). These proportions indicate that private boat non-conformance in the Gulf of Maine may be increasing but the proportion of kept cod above the bag limit is still well below pre-Amendment 7 levels.

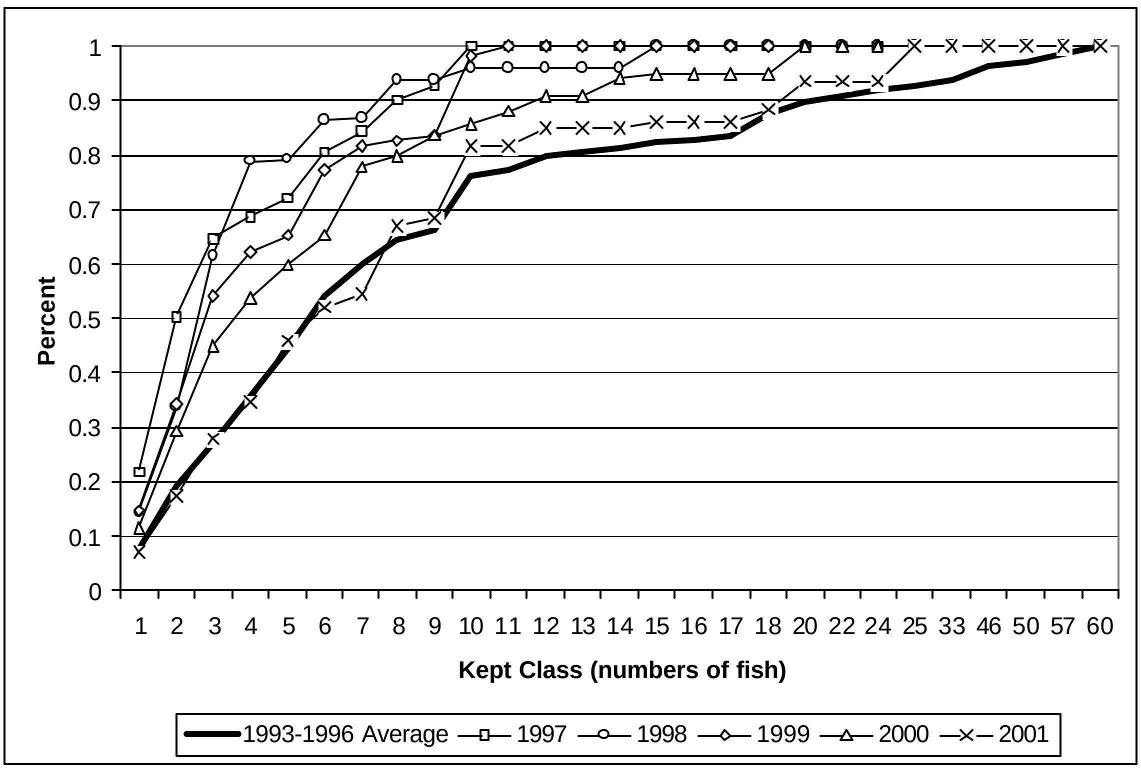


Figure 312 - Cumulative percent of Gulf of Maine cod kept by kept class for private boat. 1993-2001.
Source Data: NMFS MRFSS database. Years denote calendar years.

The private boat mode is subject to both bag and size limit regulations. The average combined non-conformance rate in this mode for Gulf of Maine cod was about 20% of which 17% was associated with a propensity to retain fish below the Federal minimum size of 21". In more recent years, combined non-conformance has been 34% and 26% in calendar years 2000 and 20001 respectively.

There are a number of reasons why the Gulf of Maine cod private boat recreational catch does not conform to Federal regulations. From 1997 to 2001 state landings laws were not consistent with Federal regulations in all Gulf of Maine states. Anglers may know the landings laws in their own state but may not know what the Federal regulations are even if they are fishing in Federal waters. Still other anglers may simply choose not to comply. Whatever the reason, at least some conservation benefit would be obtained through improved conformance with Federal size and bag limits without any changes in existing regulations. Note that the magnitude of any such conservation gains would be partially dampened by release mortality.

9.4.3.3.7 Party/Charter Fishing in the Gulf of Maine

The total number of trips taken in the Northeast region and number of anglers on those trips where any regulated groundfish were caught declined in consecutive years from 1996 to 1999 (Table 536). However, the number of trips has increased by more than 1,500 (600 in 2000 and another 900+ in 2001). Much of this increase has occurred in the Gulf of Maine as numbers of trips and passengers fishing on Georges Bank and southward has been gradually declining since 1996.

	Georges Bank/SNE		Gulf of Maine		All Areas	
Fishing Year	**Anglers**	**Trips**	**Anglers**	**Trips**	**Anglers**	**Trips**
1995	31,647	1,750	69,396	2,718	101,043	4,468
1996	38,235	1,990	70,839	2,973	109,074	4,963
1997	30,634	1,597	61,447	2,683	92,081	4,280
1998	29,484	1,400	58,234	2,605	87,718	4,005
1999	24,399	1,155	60,460	2,679	84,859	3,834
2000	22,555	1,060	73,394	3,398	95,949	4,458
2001	21,204	1,049	109,016	4,352	130,220	5,401

Table 536 - Party/charter anglers and trips by fishing year. Fishing years 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

At least 94% of party/charter trips catching groundfish in the Gulf of Maine caught one or more cod (Table 537). Cod accounted for 55% or more total fish kept and has been nearly 70% of groundfish kept in every year except 1998. In the Gulf of Maine, party/charter activity associated with groundfish and cod generally declined from 1995 to 1997, followed by increases in all subsequent years. Total cod catch increased in every year from 1997 to 2001; reaching time series highs in consecutive years (2000 and 2001).

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Total Keep	279,451	255,905	216,776	238,228	251,727	352,492	469,665
Total Kept Groundfish	233,831	205,717	174,517	200,281	217,035	310,501	412,024
Total Cod Kept	178,839	162,844	122,115	130,039	148,153	216,507	290,302
Percent Cod of Total Keep	64.0%	63.6%	56.3%	54.6%	58.9%	61.4%	61.8%
Percent Cod of Total Kept Groundfish	76.5%	79.2%	70.0%	64.9%	68.3%	69.7%	70.5%
Groundfish Trips	2,718	2,973	2,683	2,605	2,679	3,398	4,352
Cod Trips	2,644	2,798	2,537	2,500	2,565	3,290	4,196
Percent Cod	97.3%	94.1%	94.6%	96.0%	95.7%	96.8%	96.4%

Table 537 - Summary of Gulf of Maine groundfish and relative importance of cod 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

Catch and landings are expressed in <u>numbers</u> of fish.

The annual trend in Gulf of Maine cod keep indicates a downward trend in 1996 and 1997 followed by annual increases in kept cod from 1998 through 2001 (Figure 313). This pattern coincides with implementation schedule for size increases prescribed by Amendment 7. Size limits were increased in one-inch increments from 19" to 20" in 1996 and to 21" in 1997. These changes in size limits would have affected the total number of cod that could be retained by party/charter anglers. While the annual trend indicates a consistent rise in recreational catches, kept cod did not exceed that of 1995 levels until fishing year 2000.

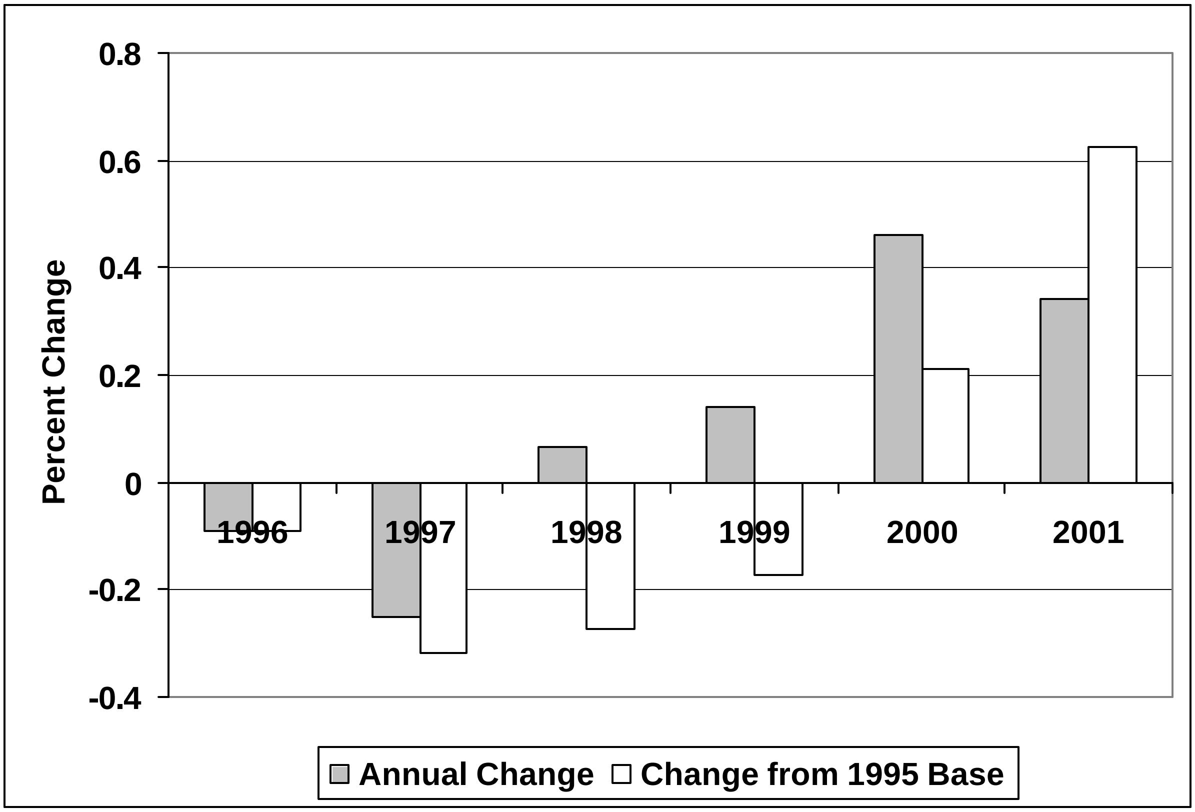


Figure 313 - Change in numbers of Gulf of Maine cod catch by party/charter mode. 1995-2000.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

Party/charter boats (with a letter of authorization) and private recreational boats have been exempted from the Gulf of Maine area closures. These exemptions have been contentious and have lead to suggestions that party/charter effort has increased particularly during earlier parts of the year. Gulf of Maine cod party/charter activity has increased and there has been an extension of effort into early spring months (March/April) (Table 538). However, compared to 1995-97 averages, the cumulative percent of trips taken prior to May was only about 3% higher in 1998, 1999, and 2001 but was about 9% higher in 2000 (Figure 314). By June, the cumulative percent of party/charter trips catching cod from 1998-2000 was approximately equal to that in 1995-1997 (43%).

Month	1995	1996	1997	1998	1999	2000	2001
Jan	0	0	1	0	1	5	8
Feb	2	0	2	1	4	15	17
Mar	30	9	9	25	27	98	55
Apr	193	161	167	219	233	420	314
May	415	441	404	427	430	478	655
Jun	551	562	467	416	442	538	771
Jul	594	589	557	507	529	534	884
Aug	450	637	507	453	492	614	810
Sep	278	268	296	317	246	403	451
Oct	115	114	110	107	140	163	187
Nov	16	16	16	27	21	22	40
Dec	0	1	1	1	0	0	4
Total Trips	2644	2798	2537	2500	2565	3290	4196

Table 538 - Number of Gulf of Maine party/charter trips that caught cod by month. 1995-2001.
Note: Data include Statistical Areas 512-515. Source Data: NMFS VTR database.
Years denote fishing years – May 1 to April 30.

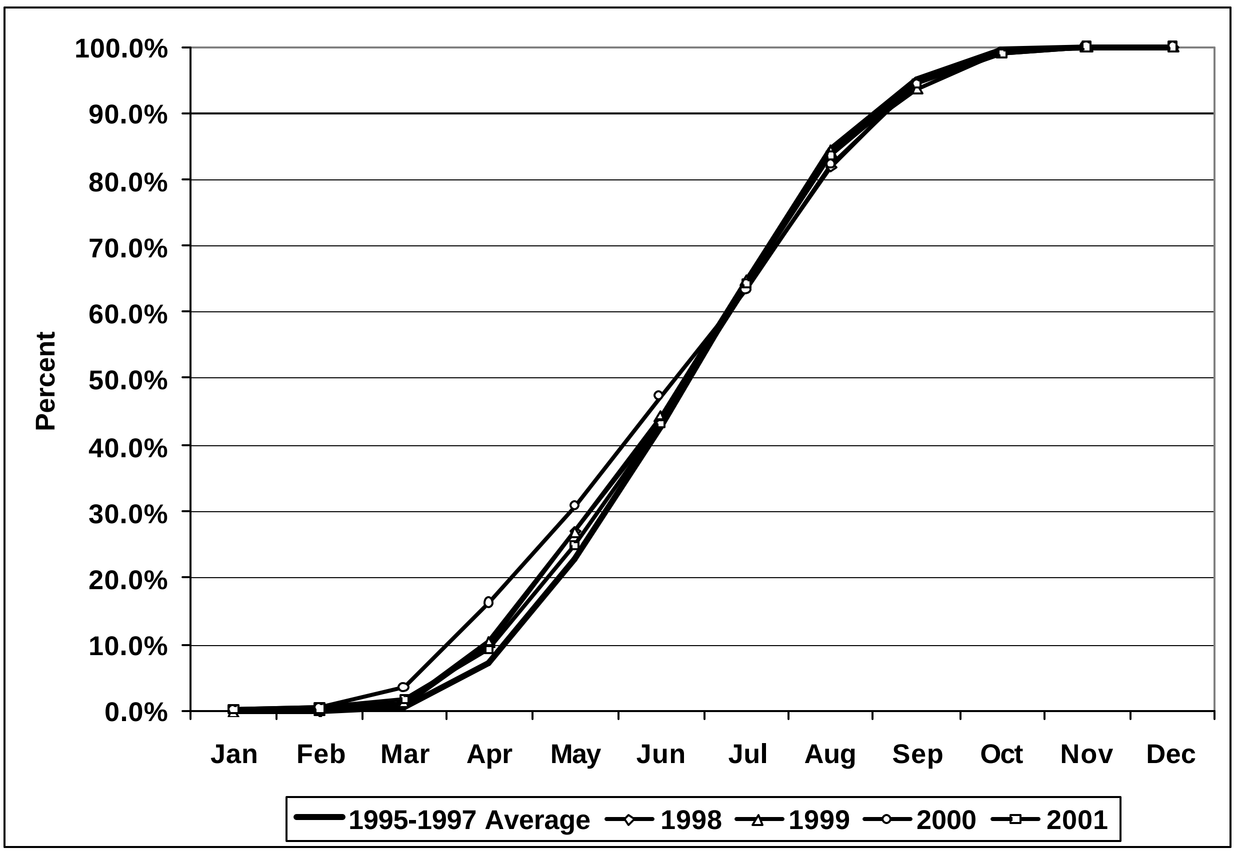


Figure 314 - Cumulative percent of party/charter trips catching cod by month. 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

In contrast to the relative distribution of trips, total Gulf of Maine cod catch shows a more distinct separation between cumulative percent of catch in March and April (approximately 25%) during fishing years 1998 and 1999 as compared to the 1995-1997 average (14%) (Figure 315). The separation in fishing year 2000 was even more pronounced (37% of total kept cod). During each of these years, much of this increase occurred in the month of April. Thus, a larger proportion of cod catch was taken in the early spring in fishing years 1998, 1999, and 2000 than in previous years, but this trend did not repeat itself in fishing year 2001. During fishing year 2001, the distribution of cod catch across months was virtually identical to that of the 1995-97 average.

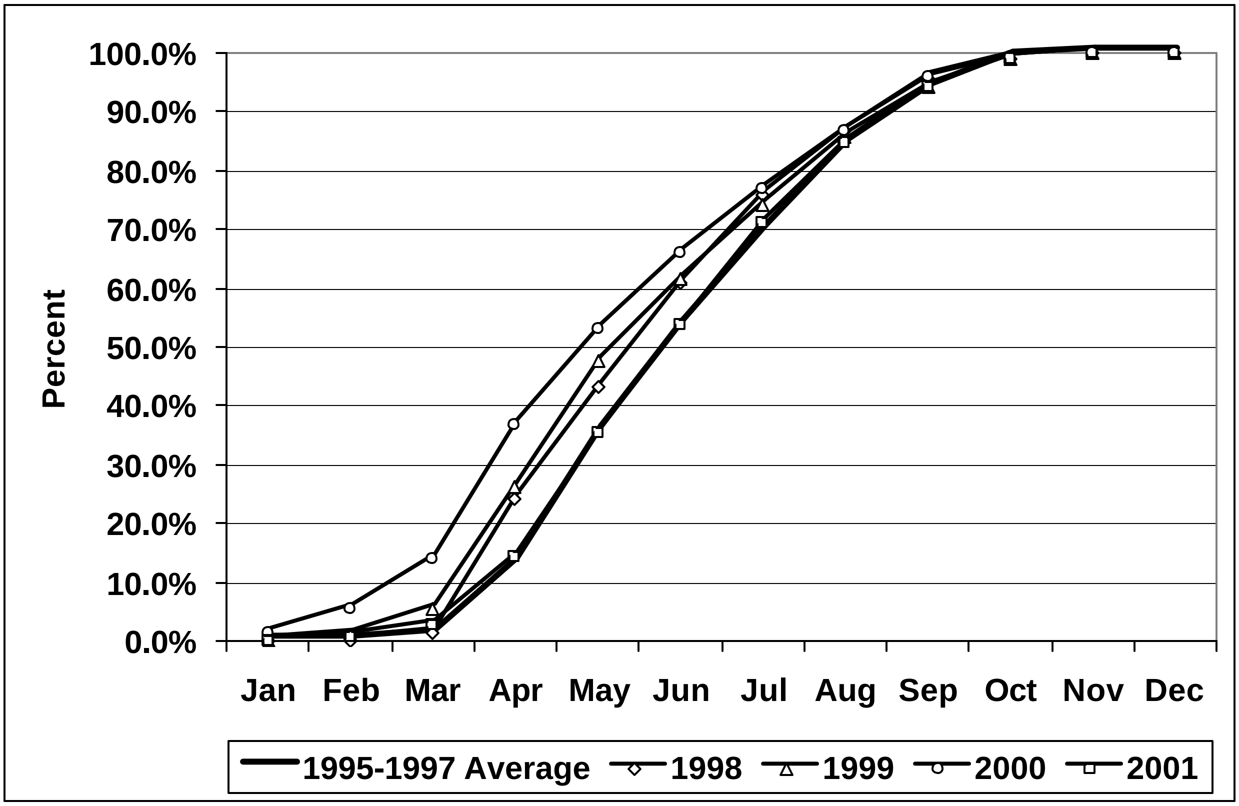


Figure 315 - Cumulative percent of party/charter cod catch by month. 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

Keep rates per trip and per passenger follow similar trends for Gulf of Maine cod (Figure 316). In every case, keep rates declined from 1995 to 1997 followed by increased keep rates in all subsequent years. Average keep rates per angler bottomed out at about 4 cod in 1997 but had risen to nearly 7 cod in 2001. Similarly, average kept cod per trip was lowest in 1998 at about 48 fish and increased by more then 27 fish in 2001.

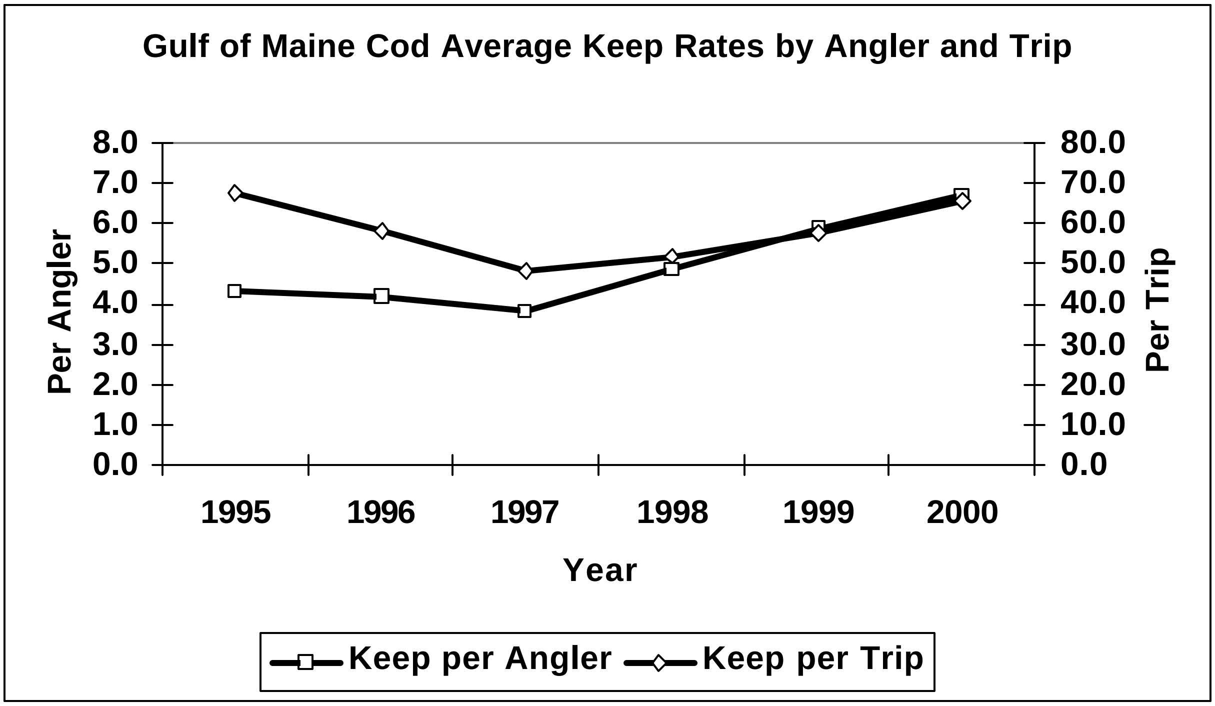


Figure 316 - Gulf of Maine average cod keep per party/charter angler and per trip 1995-2000.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.
Catch and landings are expressed in *numbers of fish.*

Although average keep rates may have been between 5 and 7 fish from 1999-2001 keep rates on any given trip may vary considerably depending on time of year and fishing location. During fishing years 1999-2001 about 48% of all party/charter trips averaged 2 or fewer kept cod per passenger (Figure 317). Nearly 90% of all trips landed 10 or fewer cod and 93% of all trips landed 15 or fewer cod per angler. Of the total number of passengers taken, 68% were on trips that landed 2 or fewer cod per passenger, 91% were on trips that landed 5 or fewer and 98% were on trips that landed 15 or fewer cod. In terms of kept cod, 18.5% of total keep occurred on trips that kept 2 or fewer fish. This means that nearly half of the trips and 68% of party/charter passengers accounted for less than 20% of total landed cod. Similarly, 88% of trips and 96% of passengers landed 10 or fewer fish but these trips and passengers accounted for 63% of total kept cod. Conversely, only 12% of trips and 6% of Gulf of Maine party/charter passengers accounted for 37% of total cod kept, and these trips averaged more than 10 fish per passenger.

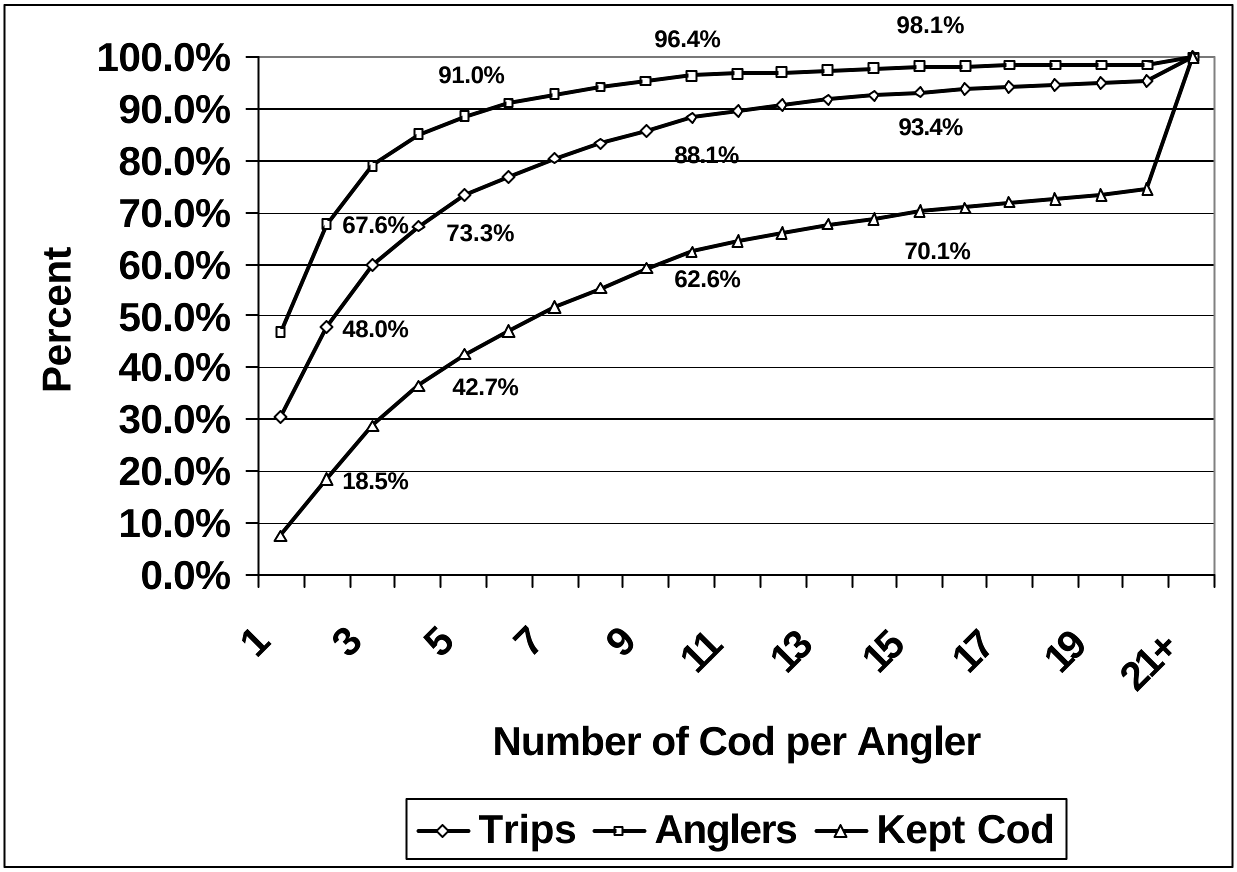


Figure 317 - Cumulative percent of party/charter trips, anglers, and Gulf of Maine cod kept catch by keep class. Fishing year 1999-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

There were a total of 140 vessels reporting taking one or more party/charter trips that caught cod during fishing year 2001. Of these vessels, 20% (28 vessels) accounted for 64% of party/charter trips, 75% of passengers, and almost 82% of total Gulf of Maine cod catch (Figure 318). Note that the 2001 fishing year was not unusual in that similar proportions were found for consecutive fishing years 1997 through 2000. Thus, in any given year, 20% of operators have accounted for the majority of party/charter activity catching Gulf of Maine cod in any given year.

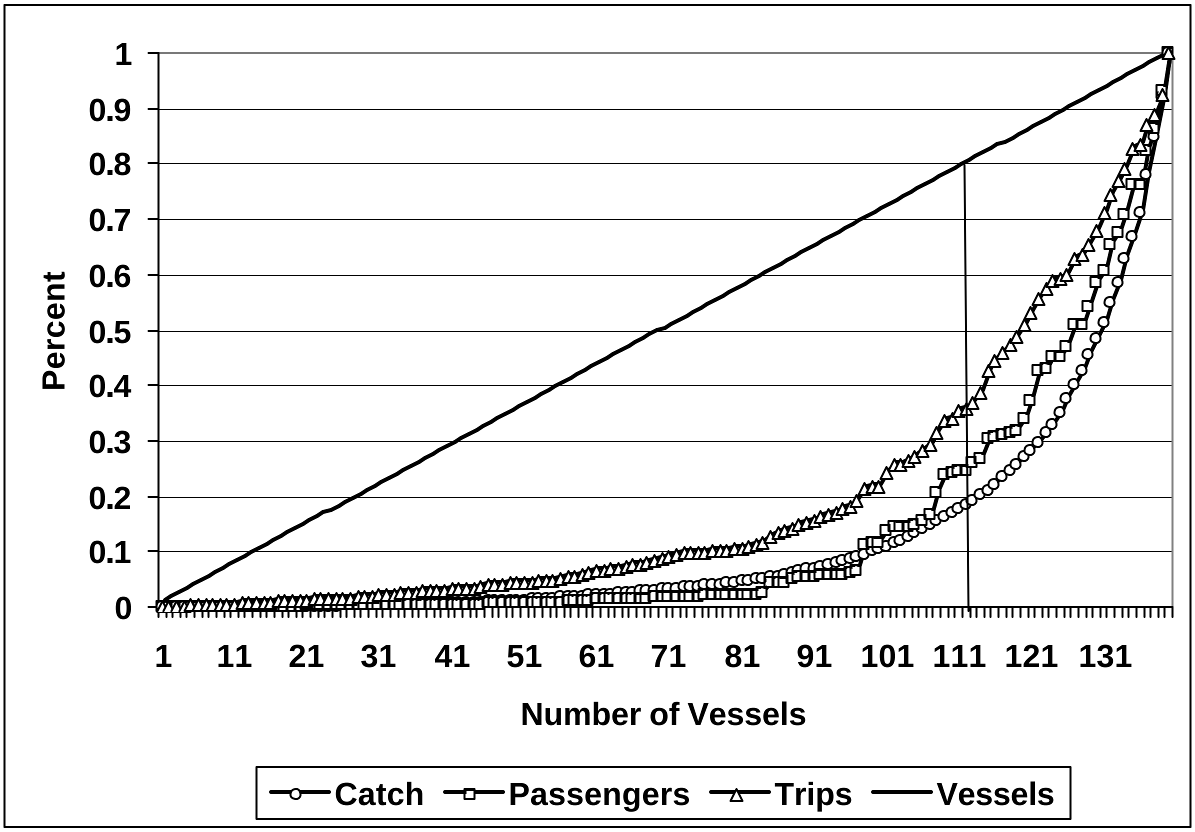


Figure 318 - Cumulative percent of party/charter trips, passengers, and Gulf of Maine cod catch. Fishing year 2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

Of the party/charter activity catching cod in the GOM, the majority (approximately 98% of both total trips and catch) have occurred in either statistical area 513 or 514 in every year since 1995. However, the relative share of activity in these two areas did undergo some changes. In 1995 the proportion of total trips taken in the two areas was almost 1:1 but the proportion of trips taken to area 513 increased in the following years reaching nearly 57% in 1997 (Figure 319). In subsequent years a shift in recreational effort seems to have occurred away from area 513 back to area 514 and in appears to have stabilized since 1999 at about a 48%/52% split between the two areas.

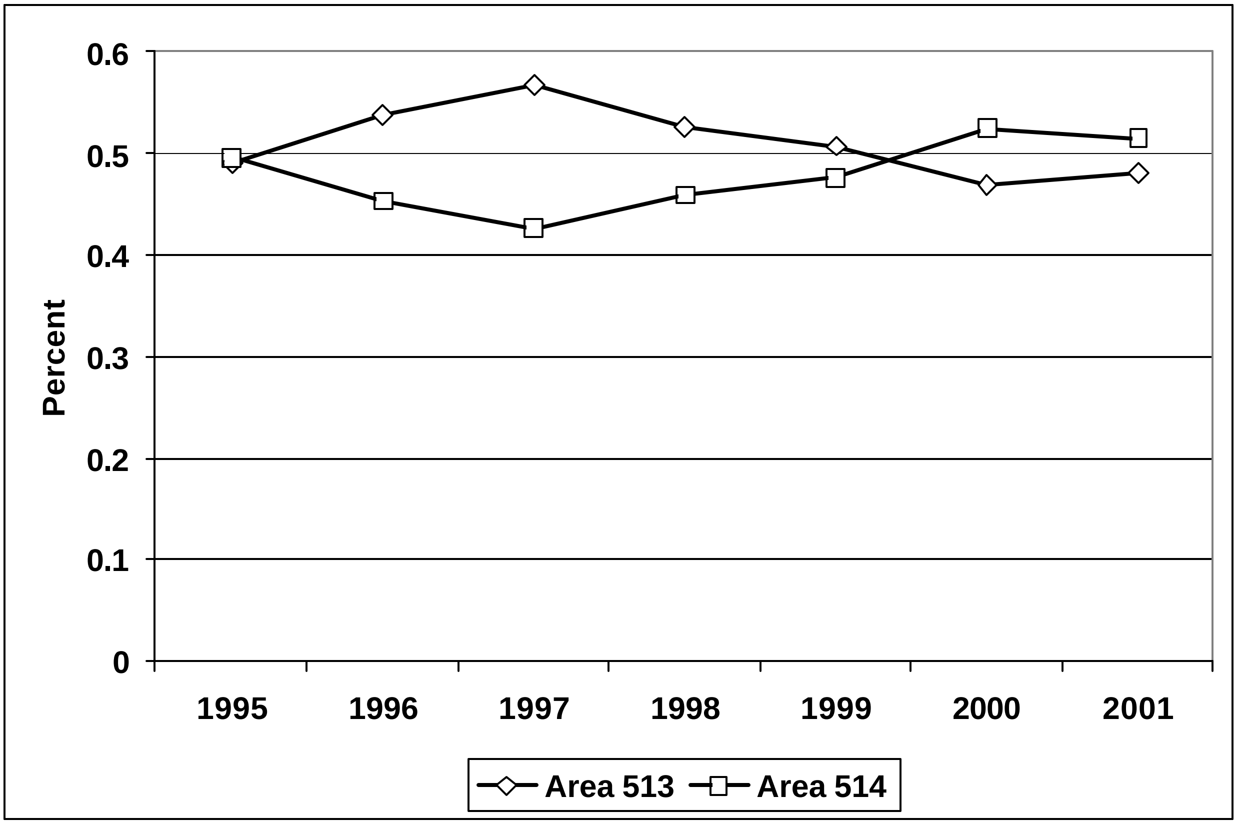


Figure 319 - Percent of Total Party/Charter trips Taken in the Statistical Areas 513 and 514. Fishing years 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

Even though the proportional number of trips was approximately equal in 1995, 59% of GOM cod catch came from area 514 while 41% of catch came from area 513 (Figure 320). With a shift toward area 513 in 1996 to 1998, the proportion of cod catch from area 514 declined to approximately 50% in 1998. After 1997, effort in area 514 increased, while it declined in area 513. Over the past two fishing years about 62% of kept cod came from area 514 and 38% from area 513. The apparent shift toward area 514 may be a response to increased availability of the resource to recreational fishermen, as commercial fishing is restricted by area and seasonal closures. If this is the case, then one would expect to observe both an increase in the amount of effort in area 514 associated with early spring months coupled with an increase in catch.

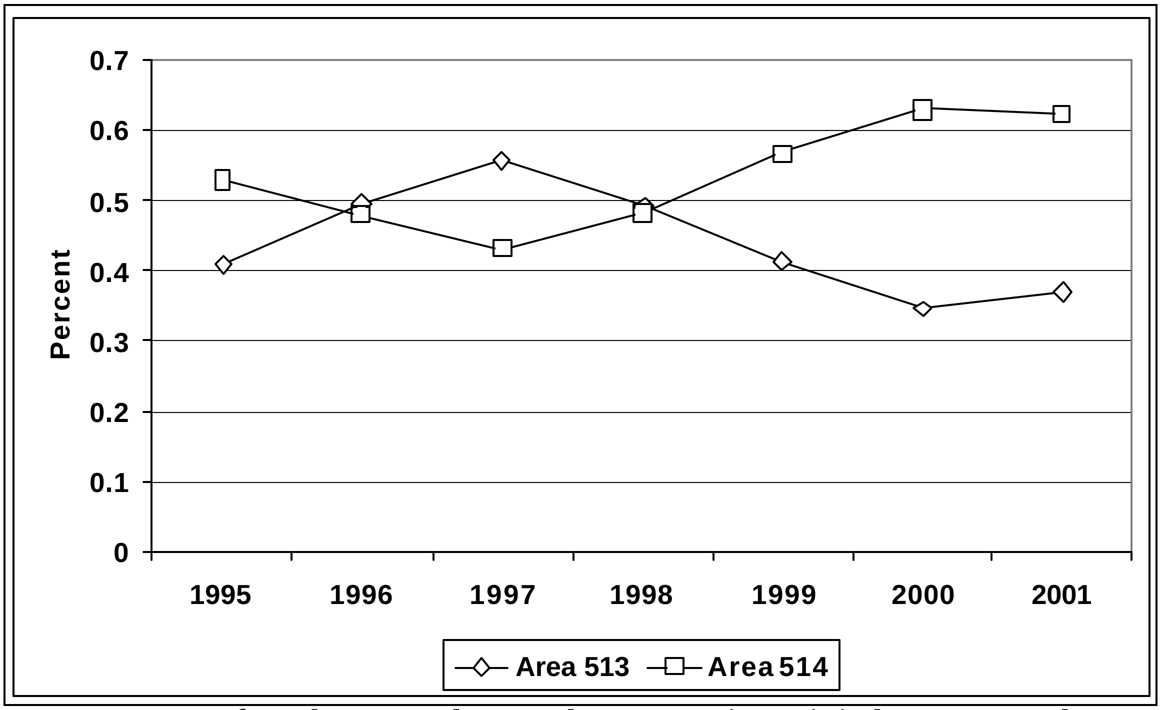


Figure 320 - Percent of Total GOM Cod Party/Charter Keep in Statistical Areas 513 and 514. Fishing years 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

Party/Charter GOM kept cod in area 514 does show a shift toward the early spring months as compared to the rest of the year (Figure 30). Compared to the 1995-97 average (17%), the proportion of total annual catch in area 514 during March and April more than doubled in 1998 (35%), 1999 (41%), and 2000 (52%). However, the relative distribution of kept cod in 2001 was nearly identical to that of the 1995-1997 baseline. Also, with the exception of fishing year 2000, the relative distribution of effort either in terms of trips or passengers from 1998-2001 was nearly identical to that of the 1995-97 averages (Figure 322 and Figure 323). Thus, the increase in the proportion of GOM cod catch in area 514 is more likely to be associated with improved catch rates in the spring months rather than to a shift in effort specifically targeting cod during this time of year. In fact, the general increase in number of trips and passengers on party/charter vessels represents a general increase in effort distributed throughout the year rather than in any specific time period.

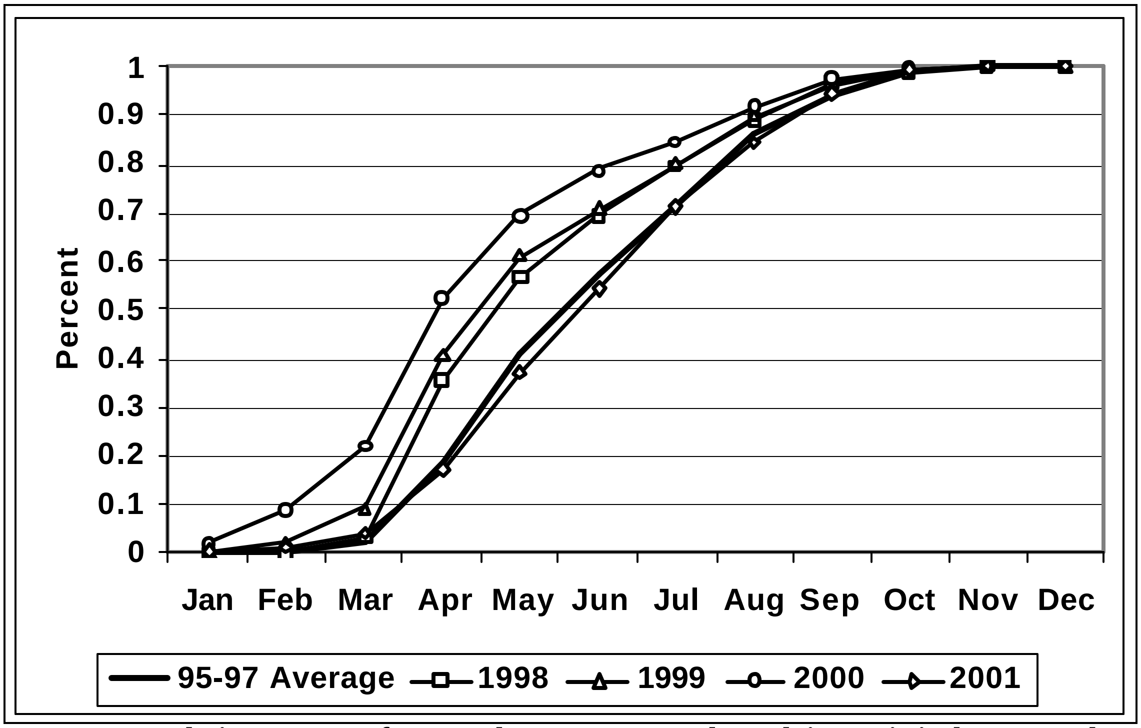


Figure 321 - Cumulative Percent of Party/Charter GOM Cod Catch in Statistical Area 514 by Month. Fishing years 1995-2001.

Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

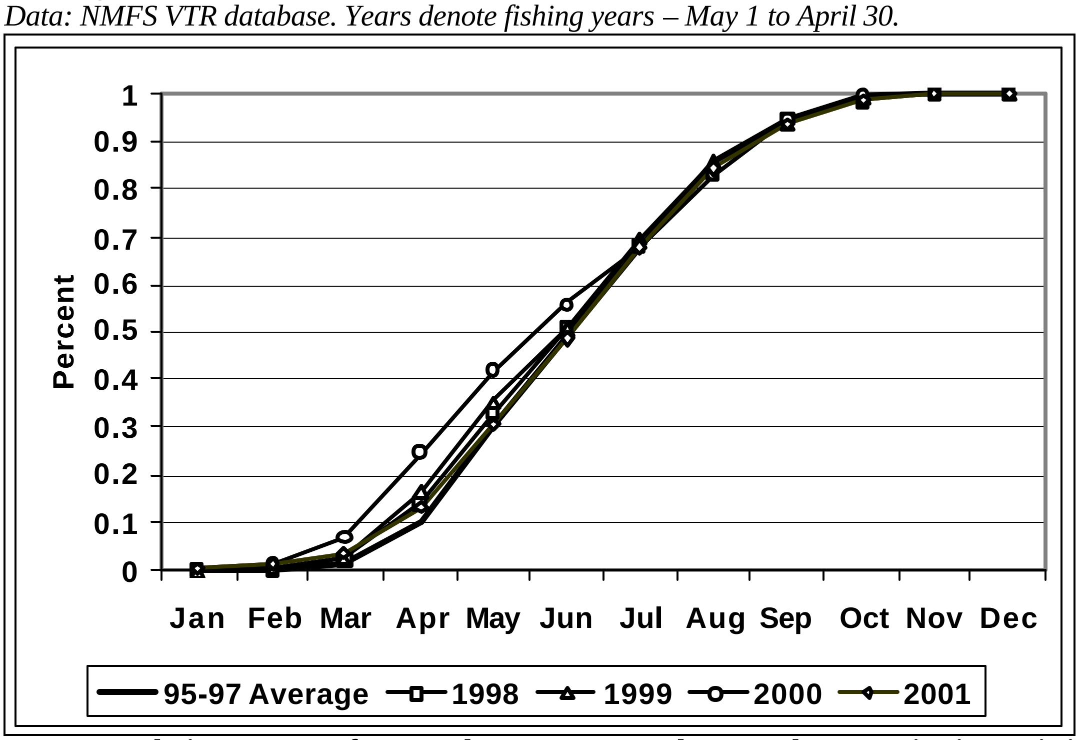


Figure 322 - Cumulative Percent of Party/Charter GOM Cod Party/Charter Trips in Statistical Area 514 by Month. Fishing years 1995-2001.

Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

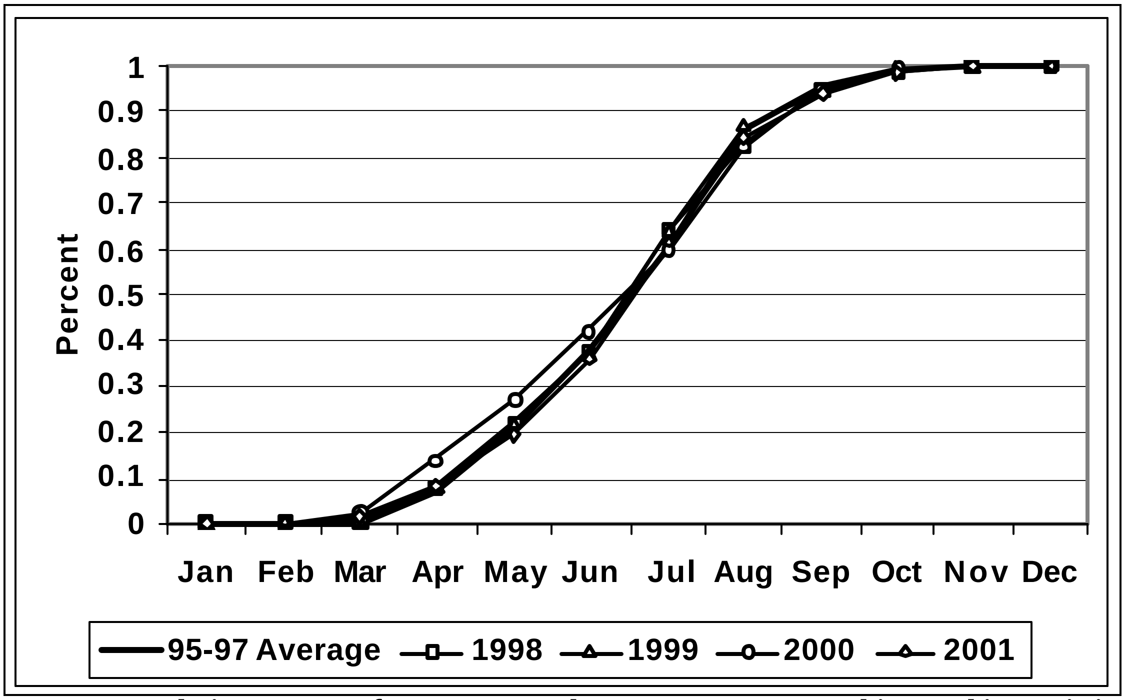


Figure 323 - Cumulative Percent of GOM Party/Charter Passengers Catching Cod in Statistical Area 514 by Month. Fishing years 1995-2001.
Source Data: NMFS VTR database. Years denote fishing years – May 1 to April 30.

9.4.3.4 Synthesis

Recreational Activity
Recreational fishing participation in the North Atlantic region (Maine to Connecticut) has remained nearly constant over the last 20 years. Over this time period catch per trip declined from 1981 to 1992 and has fluctuated without trend from 1992 onward yet the number of trips taken per participant has increased since 1989. Although participation in the Mid-Atlantic region has exhibited greater variability over time the trends in catch and trips per participant are similar to that of the North Atlantic with increasing trip taking behavior despite relatively flat changes in catch rate and in the face of an increasing regulatory framework. Thus, at least in aggregate, recreational trip demand in the Northeast region appears to be relatively robust with respect to changing stock conditions and regulatory regime.

Over the past six years the sum of all regulated groundfish in the Northeast region has accounted for about 3% of total recreationally caught fish. However, the relative contribution of groundfish to total recreational catch varies among fishing modes and regions. In the North Atlantic region groundfish accounted for about 10% of total catch but was more than 40% of total catch in the party/charter mode. Groundfish catches were about 8% of the North Atlantic private boat catch and 3% of the shore mode. By contrast, regulated groundfish comprised less than 2% of recreational catch across all fishing modes in the Mid-Atlantic region. This means that changes in groundfish regulation would affect a relatively small component of Northeast region recreational fisheries as a whole, but the impact would be greatest on party/charter anglers fishing from sites in New England.

From 1995 to 2001 approximately half (250 to 300) of all party/charter operators subject to mandatory reporting report landing regulated groundfish at some time during the year. Fishing activity by these vessels in fishing year 2001 was a seven-year high in terms of numbers of trips, passengers, total keep, and total groundfish keep. However, average groundfish keep per trip and groundfish keep per angler was similar to that of fishing year 2000 and was within the range of observed levels since 1995.

The majority (98%) of groundfish catch by New England party/charter operators is comprised of cod, haddock, and pollock. Of these three species cod has averaged about 70% of total groundfish keep from 1998 to 2001. In the Gulf of Maine at least 94% of all trips catching groundfish caught at least one cod with keep rates increasing from 4 cod per angler in 1995 to nearly 7 fish in 2001. However, these averages do not adequately capture the potential effect of regulatory changes on Gulf of Maine party/charter anglers. During fishing years 1999-2001 about 48% of all party/charter trips averaged 2 or fewer kept cod per passenger (Figure 317). Nearly 90% of all trips landed 10 or fewer cod and 93% of all trips landed 15 or fewer cod per angler. Of the total number of passengers taken, 68% were on trips that landed 2 or fewer cod per passenger, 91% were on trips that landed 5 or fewer and 98% were on trips that landed 15 or fewer cod. In terms of kept cod, 18.5% of total keep occurred on trips that kept 2 or fewer fish. This means that nearly half of the trips and 68% of party/charter passengers accounted for less than 20% of total landed cod. Similarly, 88% of trips and 96% of passengers landed 10 or fewer fish but these trips and passengers accounted for 63% of total kept cod. Conversely, only 12% of trips and 6% of Gulf of Maine party/charter passengers accounted for 37% of total cod kept, and these trips averaged more than 10 fish per passenger.

Party/Charter Operators

Throughout the Northeast region the total number of unique vessels issued a Federal permit to carry passengers for hire in any given fishery ranged from a high of 990 in 1995 to a low of 752 in 1998. Exclusive of limited access permit holders that may also take passengers for hire, the number of party/charter permits issued under the multispecies FMP was approximately 500 from 1997 to 1999 but increased to about 650 in both FY2001 and 2002. The number of vessels actually reporting party/charter activity for groundfish has ranged between 250 and 300 vessels from 1995 to 2001, about half the number of permitted vessels.

Massachusetts has the largest number of federally permitted party/charter vessels reporting groundfish catches followed by New Jersey, New York, New Hampshire and Maine. Note that groundfish catch for New Jersey and New York vessels represents a very small proportion of fishing activity. Thus even though there may be 40-50 vessels in each of these states that landed some groundfish the impact of groundfish management on these vessels is likely to be minor. In Massachusetts party/charter operators hailed from 31 different home ports with notable concentrations in the ports of Gloucester, Green Harbor, Newburyport, Plymouth and Salisbury. The majority of New Hampshire vessels operated from the ports of Hampton and Portsmouth while Maine operators were based in Boothbay Harbor, Kennebunkport, Kittery, and Portland (two vessels each in FY2001).

A large majority (about 75%) of party/charter operators that landed groundfish earn 100% of annual fishing income from passenger fees and nearly 85% of vessels earned at 75% or more of annual fishing income from passenger fees. Thus, only a small number of vessels have diversified into both commercial and recreational fishing business activity. Even though most party/charter operators depend on passenger fees for fishing income there are wide differences among the fleet in terms of level of activity particularly with respect to Atlantic cod. In the Gulf of Maine about 20% of operating vessels account for more than 60% of all trips that kept cod, more than 70% of all passengers taken on these trips, and reported over 80% of total kept cod. Since cod is typically caught on more 95% of party/charter trips in the Gulf of Maine, 20-30 vessels conduct the majority of party/charter business in the Gulf of Maine. This also means that while recreational management measures for groundfish will affect the entire fleet the impact of those regulations will not be uniformly distributed but will fall on a relatively small number of vessels.

Effectiveness of Regulations (1997 to 2001)
Due to low sample sizes for Georges Bank cod, the effectiveness of bag and size limits that had been in effect since from 1997 to 2001 could not be evaluated. Limited data indicate that for the private boat mode the proportion of Georges Bank cod retained above the 10 fish limit has likely declined but it is not possible to determine whether this improvement may be due to compliance or to declining stock conditions. Unfortunately, there were not enough measured fish to ascertain whether the size limit for the party/charter and private boat modes were effective.

Size limit conformance in the Gulf of Maine differs markedly between recreational fishing modes. On average, about 9% of party/charter kept cod was not in conformance with Federal size regulations in effect (19") from 1993 to 1996. From 1997 to 2000 less than 4% of cod kept by party/charter passengers was below the Federal size limit (20" in 1997 and 21" thereafter) but was 16% in calendar year 2001. Compared to the 1993-1996 average non-conformance rate, the average rate since implementation of Amendment 7 has improved to 6% or equivalently, 94% of cod retained by party/charter anglers has been at or above the Federal size limit.

By contrast, 23% of the private boat kept cod was not in conformance with the Federal size limit prior to Amendment 7 and was at least that much in 1997, 1999, and 2000. The non-conformance rate was about 8% and 10% in 1998 and 2001 respectively. Compared to the 1993-96 average, the 1997-2001 average non-conformance rate improved to about 19%; still more than three times as great as that of party/charter anglers.

Conformance by Gulf of Maine private boat anglers has resulted in a decline in the proportion of retained fish in excess of the 10 fish bag limit. From 1993 to 1996 approximately 33% of cod was retained on trips where more than 10 fish were kept. From 1997 to 1999 less than 4% of cod was on trips that kept more than 10 fish. In both 2000 and 2001 proportionally more fish were retained above the bag limit (12% and 18% respectively). These proportions indicate that private boat non-conformance in the Gulf of Maine may be increasing but the proportion of kept cod above the bag limit is still well below pre-Amendment 7 levels.

The private boat mode is subject to both bag and size limit regulations. The average combined non-conformance rate in this mode for Gulf of Maine cod was about 20% of which 17% was associated with a propensity to retain fish below the Federal minimum size of 21". In more recent years, combined non-conformance has been 34% and 26% in calendar years 2000 and 20001 respectively.

There are a number of reasons why the Gulf of Maine cod private boat recreational catch does not conform to Federal regulations. From 1997 to 2001 state landings laws were not consistent with Federal regulations in all Gulf of Maine states. Anglers may know the landings laws in their own state but may not know what the Federal regulations are even if they are fishing in Federal waters. Still other anglers may simply choose not to comply. Whatever the reason, at least some conservation benefit would be obtained through improved conformance with Federal size and bag limits without any changes in existing regulations. Note that the magnitude of any such conservation gains would be partially dampened by release mortality.

9.4.4 Processing and wholesale trade sector

Fresh fish processing and frozen fish processing are two separate industries in New England, each with its own customers, firms, and industrial organizations (Georgianna and Dirlam 2000). Fresh fish processors buy whole fresh supplies from fishermen locally and at other New England ports, and they bring in fresh supplies from other parts of the U.S., Canada and other countries. They process the product (for example, cutting fish into fillets) and sell it to wholesalers, retailers, restaurants, and other users. Groundfish processors in the United States buy frozen imports from Canada, Iceland, Norway, and other nations around the world. These products, mainly frozen blocks of fillets, are processed into frozen portions, sticks, and other products for sale to supermarkets, restaurants, and institutions. Frozen products keep for a long time and are not subject to the same time constraints as fresh products. Prices are less volatile, markets more impersonal, and business relations more competitive. Frozen groundfish plants are also much larger than fresh groundfish plants, and they operate longer through the day and through the year. Few fresh groundfish processors produce frozen product, and those that do sell special orders to institutions, usually government agencies, which are sometimes required to purchase U.S. product (Georgianna and Dirlam 2000). Wholesale firms do not process fish, but buy from processors and sell to retail outlets, institutions and other buyers.

Data Sources

Employment and landings data for the wholesale and processing sectors was provided by NMFS for calendar years 1995 through 1999. Additional employment data is reported from the County Business Patterns (CBP) database of the U.S. Census Bureau for 1998 to 2001, and provides information on the number of establishments within fishing industry sectors. In this section, industry sectors are reported by North American Industry Classification System (NAICS) code for each state. More detailed information on fishing industry sector employment is provided at the county level in Section 9.4.5. See section 9.4.5.5 for a comprehensive description of Census data and an overview of the NAICS codes highlighted in this document.

Discussion

According to NMFS unpublished data, the number of processing firms in New England has declined since 1995, while wholesaling firms have increased in number (Figure 325). There was an increase in processing sector employment until 1997, followed by a decline. Wholesale sector employment had the opposite trend with a decline until 1997, followed by an increase to its highest level in 1999 (Figure 324).

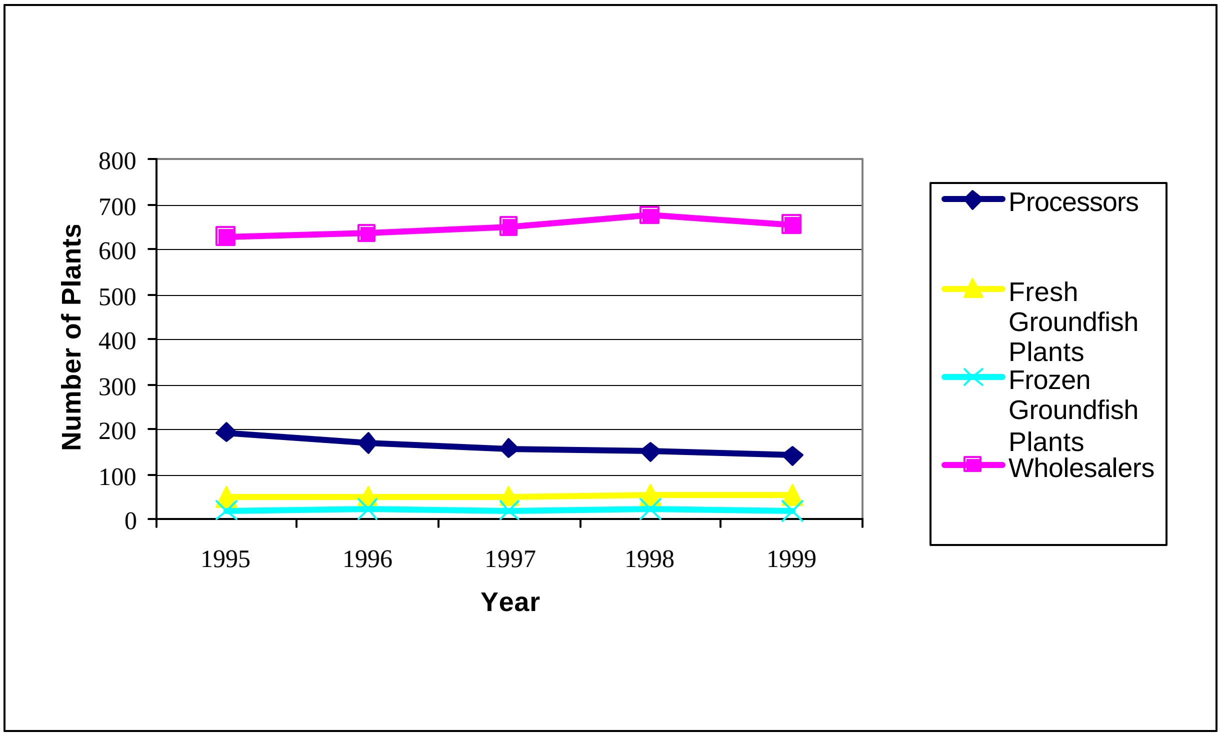


Figure 324 - New England processing and wholesale sector employment, 1995-1999.
Source Data: NMFS unpublished data. Years denote calendar years.

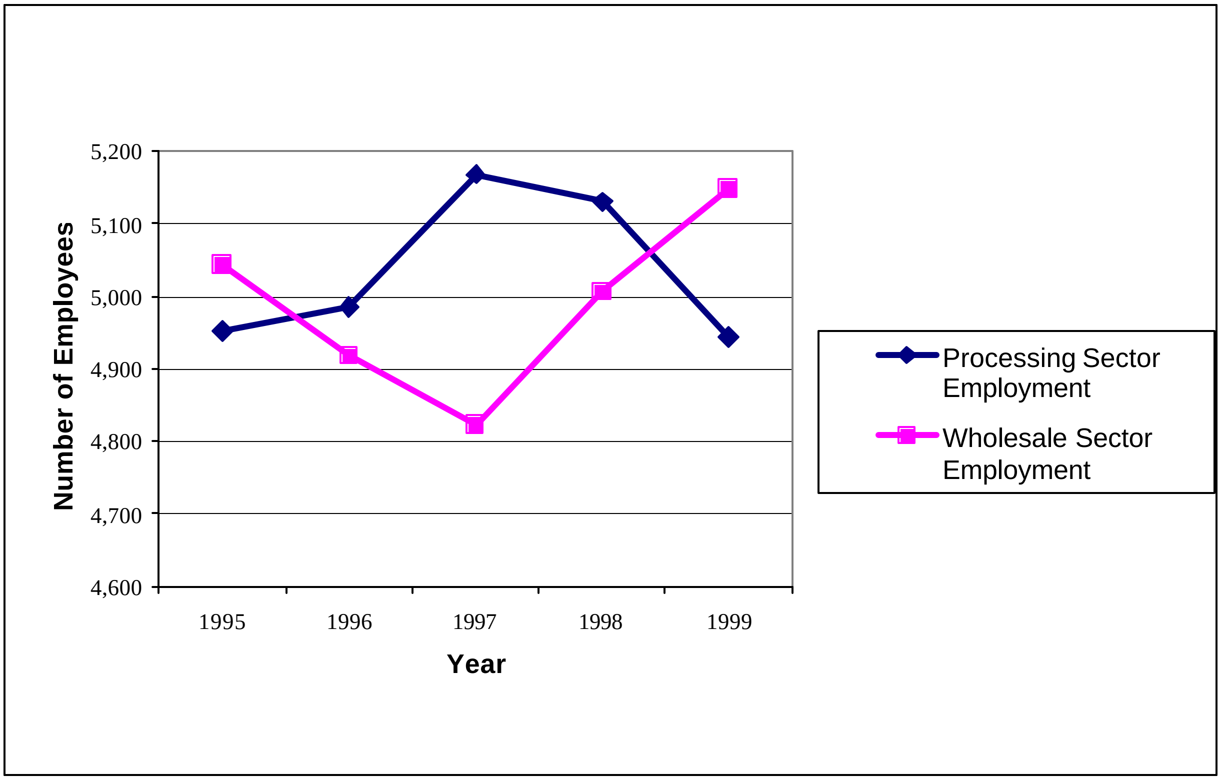


Figure 325 - Number of employees in wholesale and processing sectors in New England, 1995-1999.
Source Data: NMFS unpublished data. Years denote calendar years.

It is estimated that more than one-third of the fresh processing firms in business in 1992 are no longer operating, although the number of plants has been stable since 1995 (Figure 325). Surviving firms are now paying more attention to the their net revenues (Georgianna and Dirlam 2000). Most groundfish landed in New England is sold into the fresh fish market, and landings since 1995 have been less than the total volume of processed products in terms of live weight (Figure 328). This has led fresh fish processors in the Northeast to acquire additional products from Canada and the west coast of the United States. Recently, processors increased imports from Iceland because air cargo routes into Logan airport were being used less frequently by Canadian suppliers. Both the inflation-adjusted value of fresh groundfish processed and the average volume have declined since 1995 (Figure 329). Firms have compensated for this decline by expanding their product line to substitute species such as farmed salmon, shark, tilapia, mahi mahi, orange roughy and catfish (Georgianna and Dirlam 2000). The majority of these processing facilities are in Massachusetts. Plants located in Massachusetts have a distinct competitive advantage because of their proximity to Boston's Logan airport (Georgianna and Dirlam 2000).

According to CBP data, in both New England (ME, NH, MA, RI, and CT) and the Mid-Atlantic (NY, NJ, DE, MD, VA, and NC) the number of seafood product preparation and packaging (processing) establishments remained stable from 1998 to 2001. In both regions, the number of fish and seafood wholesale establishments declined slightly across the period. However, the number of wholesale establishments exceeded the numbers of processing and market establishments in all four years. Fish and seafood markets outnumbered processing establishments in New England and the Mid-Atlantic, this number increasing slightly from 1998 to 2001 (Table 539, Figure 326, and Figure 327). The number of establishments in these sectors is generally lower than those reported by NMFS. The discrepancies are likely a result of differences in the ways in which processing and wholesale sectors were defined and data were collected and compiled by NMFS and the U.S. Census Bureau. The relative numbers of processing and wholesale establishments are similar in CBP and NMFS data, and indicate a more dominant presence of wholesalers over processors in New England.

NAICS Sector Participation by State

Table 540 – Table 549 report the number of establishments and annual payroll by state for NAICS industry sectors 3117 – Seafood Product Preparation and Packaging (includes 311711 – Seafood Canning, and 311712 – Fresh and Frozen Seafood Processing); 42246 – Fish and Seafood Wholesalers; and 44522 – Fish and Seafood Markets.

Maine and Massachusetts reported the greatest number of seafood product preparation and packaging establishments in New England, with Connecticut reporting the smallest number from 1998 to 2001 (Table 540). This sector generally remained stable across the period, with some increase in Maine in 1999 and 2000.

A greater number of fresh and frozen seafood processing establishments (311712) was reported in New England states than seafood canning establishments (311711) from 1998 to 2001. The majority of seafood canning establishments were reported in Maine, this sector diminishing for all states across the time period (Table 541). Fresh and frozen seafood processing establishments were relatively stable during these years, with some overall fluctuation (Table 542). Massachusetts reported the greatest number of processing establishments, followed by Maine.

The number of seafood product preparation and packaging establishments declined overall in the Mid-Atlantic states from 1998 to 2001 (Table 543). This sector increased slightly in New York and New Jersey over the period, remained stable in Delaware at one establishment, and declined further south

(Maryland, Virginia and North Carolina). Virginia reported the greatest number of processing establishments in all years.

The number of seafood product preparation and packaging establishments exceeded the number of seafood canning establishments in Mid-Atlantic states from 1998 to 2001. Seafood canning establishments increased in number while processing establishments decreased (Table 544 and Table 545). The number of seafood canning establishments in the Mid-Atlantic states was much lower than that reported in New England, while the number of processors was about the same. Virginia reported the greatest number of seafood preparation and packaging establishments in the Mid-Atlantic.

In New England, Massachusetts reported the highest number of fish and seafood wholesale establishments, followed by Maine (Table 546). Wholesalers declined in number in New England from 1998 to 2001, particularly in Maine. Mid-Atlantic states reported slightly fewer wholesale establishments than New England states, with New York reporting the greatest number, followed by Virginia (Table 547).

The number of fish and seafood markets increased in both New England and Mid-Atlantic states from 1998 to 2001 (Table 548 and Table 549). The Mid-Atlantic reported a higher number of markets than New England, with the majority of these establishments in New York. In New England, Massachusetts reported the greatest number of fish and seafood markets during this period.

NAICS Code	Number of Establishments	1998	1999	2000	2001
3117 Seafood Product Preparation and Packaging	Total New England	96	102	101	93
	Total Mid-Atlantic	122	115	117	114
311711 Seafood Canning	Total New England	22	25	23	19
	Total Mid-Atlantic	14	15	18	18
311712 Fresh and Frozen Seafood Processing	Total New England	74	77	78	74
	Total Mid-Atlantic	119	113	110	110
42246 Fish and Seafood Wholesalers	Total New England	560	536	503	474
	Total Mid-Atlantic	407	406	394	395
44522 Fish and Seafood Markets	Total New England	196	210	207	225
	Total Mid-Atlantic	311	317	327	344

Table 539 - Processing and Wholesale Establishments in New England and Mid-Atlantic States, 1998-2001

Data Source: County Business Patterns database

Note: NAICS industry sectors 311711 and 311712 are subsets of 3117

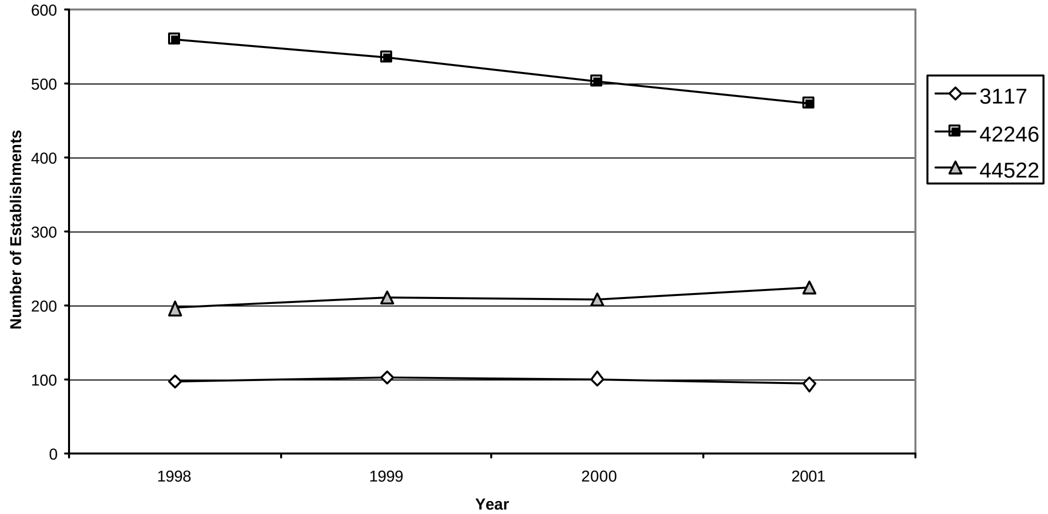


Figure 326 - Number of Processing, Wholesale, and Market Establishments in New England States, 1998-2001

Data Source: County Business Patterns database
NAICS 3117 = Seafood Product Preparation and Packaging
NAICS 42246 = Fish and Seafood Wholesalers
NAICS 44522 = Fish and Seafood Markets

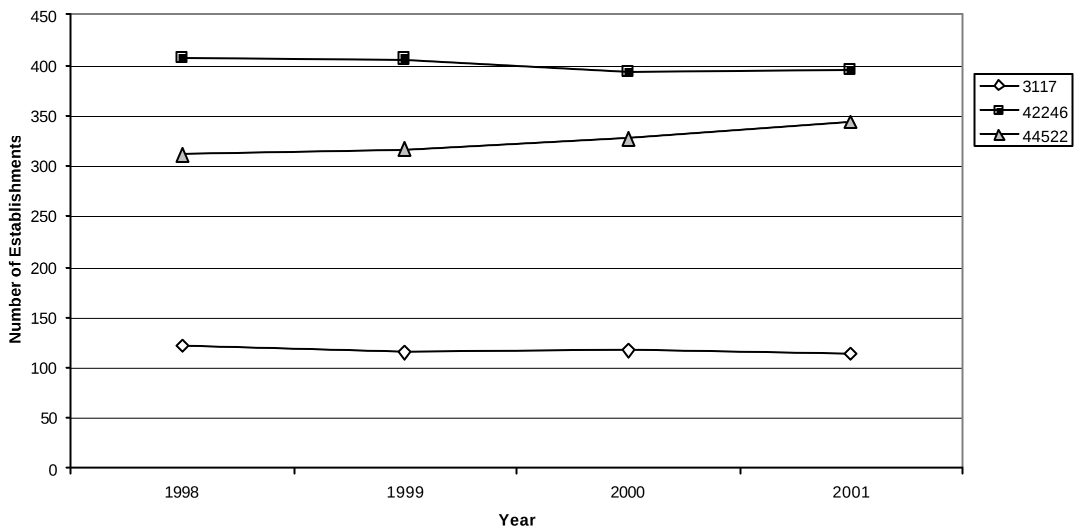


Figure 327 - Number of Processing, Wholesale, and Market Establishments in Mid-Atlantic States, 1998-2001

Data Source: County Business Patterns database
NAICS 3117 = Seafood Product Preparation and Packaging
NAICS 42246 = Fish and Seafood Wholesalers
NAICS 44522 = Fish and Seafood Markets

NAICS Code	3117 Seafood Product Preparation and Packaging						
Year	**Data**	**Maine**	**New Hampshire**	**Massachusetts**	**Rhode Island**	**Connecticut**	**Total New England**
1998	Number of Establishments	35	8	41	8	4	96
	Annual Payroll ($1,000)	$12,153	$10,076	$72,700	E	E	$94,929
1999	Number of Establishments	43	8	42	6	3	102
	Annual Payroll ($1,000)	$12,676	$9,377	$77,625	$6,681	$0	$106,359
2000	Number of Establishments	40	10	42	6	3	101
	Annual Payroll ($1,000)	$12,110	$9,952	$82,907	$7,184	$0	$112,153
2001	Number of Establishments	36	8	41	6	E	93
	Annual Payroll ($1,000)	$13,125	E	$83,249	$7,581	E	$103,955

Table 540 - Number of Establishments and Annual Payroll ($1,000) for NAICS 3117 in New England, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*

NAICS Code	311711 Seafood Canning						
Year	**Data**	**Maine**	**New Hampshire**	**Massachusetts**	**Connecticut**	**Rhode Island**	**Total New England**
1998	Number of Establishments	12	2	5	1	2	22
	Annual Payroll ($1,000)	$8,908	E	E	E	E	$8,908
1999	Number of Establishments	16	2	6	0	1	25
	Annual Payroll ($1,000)	$8,676	E	$893	$0	E	$9,569
2000	Number of Establishments	15	2	5	0	1	23
	Annual Payroll ($1,000)	$7,836	E	$1,292	$0	E	$9,128
2001	Number of Establishments	11	2	5	0	1	19
	Annual Payroll ($1,000)	E	E	$1,600	$0	E	$1,600

Table 541 - Number of Establishments and Annual Payroll ($1,000) for NAICS 311711 in New England, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*
Note: NAICS industry sectors 311711 and 311712 are subsets of 3117

NAICS Code	311712 Fresh and Frozen Seafood Processing						
Year	**Data**	**Maine**	**New Hampshire**	**Massachusetts**	**Rhode Island**	**Connecticut**	**Total New England**
1998	Number of Establishments	23	6	36	6	3	74
	Annual Payroll ($1,000)	$3,245	E	E	E	E	$3,245
1999	Number of Establishments	27	6	36	5	3	77
	Annual Payroll ($1,000)	$4,000	E	$76,732	E	E	$80,732
2000	Number of Establishments	25	8	37	5	3	78
	Annual Payroll ($1,000)	$4,274	E	$81,615	E	E	$85,889
2001	Number of Establishments	25	6	36	5	2	74
	Annual Payroll ($1,000)	E	E	$81,649	E	E	$81,649

Table 542 - Number of Establishments and Annual Payroll ($1,000) for NAICS 311712 in New England, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*
Note: NAICS industry sectors 311711 and 311712 are subsets of 3117

NAICS Code	3117 Seafood Product Preparation and Packaging							
Year	**Data**	**New York**	**New Jersey**	**Delaware**	**Maryland**	**North Carolina**	**Virginia**	**Total Mid-Atlantic**
1998	Number of Establishments	18	14	1	28	33	46	122
	Annual Payroll ($1,000)	$13,404	$17,990	E	$21,651	$13,806	$29,441	$82,888
1999	Number of Establishments	19	18	1	27	27	42	115
	Annual Payroll ($1,000)	$15,350	$18,491	E	$22,947	$11,033	$30,554	$83,025
2000	Number of Establishments	18	16	1	27	32	41	117
	Annual Payroll ($1,000)	$0	$20,655	E	$22,309	$9,337	$34,642	$86,943
2001	Number of Establishments	21	18	1	26	27	42	114
	Annual Payroll ($1,000)	$18,258	$27,302	E	$23,686	$8,510	$35,228	$94,726

Table 543 - Number of Establishments and Annual Payroll ($1,000) for NAICS 3117 in Mid-Atlantic States, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*

NAICS Code	311711 Seafood Canning						
Year	Data	New York	New Jersey	Delaware	Maryland	North Carolina	Virginia	Total Mid-Atlantic
1998	Number of Establishments	7	6	1	2	2	3	14
	Annual Payroll ($1,000)	$11,630	$10,240	E	E	E	$125	$10,365
1999	Number of Establishments	6	8	1	2	1	3	15
	Annual Payroll ($1,000)	E	$10,137	E	E	E	E	$10,137
2000	Number of Establishments	7	8	1	3	2	4	18
	Annual Payroll ($1,000)	E	$11,572	E	E	E	E	$11,572
2001	Number of Establishments	7	7	1	4	2	4	18
	Annual Payroll ($1,000)	E	$17,095	E	E	E	E	$17,095

Table 544 - Number of Establishments and Annual Payroll ($1,000) for NAICS 311711 in Mid-Atlantic States, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*
Note: NAICS industry sectors 311711 and 311712 are subsets of 3117

NAICS Code	311712 Fresh and Frozen Seafood Processing						
Year	Data	New York	New Jersey	Maryland	North Carolina	Virginia	Total Mid-Atlantic
1998	Number of Establishments	11	8	26	31	43	119
	Annual Payroll ($1,000)	$1,774	$7,750	E	E	$29,316	$38,840
1999	Number of Establishments	13	10	25	26	39	113
	Annual Payroll ($1,000)	E	$8,354	E	E	E	$8,354
2000	Number of Establishments	11	8	24	30	37	110
	Annual Payroll ($1,000)	E	$9,083	E	E	E	$9,083
2001	Number of Establishments	14	11	22	25	38	110
	Annual Payroll ($1,000)	E	$10,207	E	E	E	$10,207

Table 545 - Number of Establishments and Annual Payroll ($1,000) for NAICS 311712 in Mid-Atlantic States, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*
Note: NAICS industry sectors 311711 and 311712 are subsets of 3117

NAICS Code	42246 Fish and Seafood Wholesalers						
Year	Data	Maine	NH	Massachusetts	Connecticut	RI	Total NE
1998	Number of Establishments	210	17	256	28	49	560
	Annual Payroll ($1,000)	$33,912	$2,045	$88,551	$8,109	$12,162	$144,779
1999	Number of Establishments	201	16	247	29	43	536
	Annual Payroll ($1,000)	$34,045	E	$99,482	$8,725	$12,471	$154,723
2000	Number of Establishments	194	14	229	26	40	503
	Annual Payroll ($1,000)	$36,325	$1,813	$104,358	E	$13,153	$155,649
2001	Number of Establishments	182	14	212	25	41	474
	Annual Payroll ($1,000)	$32,599	$2,222	$105,904	E	$14,250	$154,975

Table 546 - Number of Establishments and Annual Payroll ($1,000) for NAICS 42246 in New England, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*

NAICS Code	42246 Fish and Seafood Wholesalers							
Year	Data	NY	NJ	Delaware	Maryland	NC	Virginia	Total MA
1998	Number of Establishments	323	101	7	94	97	108	407
	Annual Payroll ($1,000)	$67,377	$32,296	E	$23,498	$20,516	$20,721	$97,031
1999	Number of Establishments	313	110	5	93	90	108	406
	Annual Payroll ($1,000)	$71,437	$35,333	E	$24,214	$22,639	$22,086	$104,272
2000	Number of Establishments	305	107	4	92	86	105	394
	Annual Payroll ($1,000)	$75,538	$37,609	E	$26,940	$24,943	$21,054	$110,546
2001	Number of Establishments	296	112	5	94	84	100	395
	Annual Payroll ($1,000)	$76,881	$39,677	E	$28,847	$22,597	$21,138	$112,259

Table 547 - Number of Establishments and Annual Payroll ($1,000) for NAICS 42246 in Mid-Atlantic States, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*

NAICS Code	44522 Fish and Seafood Markets						
Year	**Data**	**Maine**	**New Hampshire**	**Massachusettts**	**Rhode Island**	**Connecticut**	**Total New England**
1998	Number of Establishments	28	7	107	22	32	196
	Annual Payroll ($1,000)	$2,119	E	$6,974	$1,400	$2,243	$12,736
1999	Number of Establishments	32	7	111	24	36	210
	Annual Payroll ($1,000)	$2,512	E	$7,071	$2,018	E	$11,601
2000	Number of Establishments	34	7	109	26	31	207
	Annual Payroll ($1,000)	E	E	$7,401	$2,596	$2,760	$12,757
2001	Number of Establishments	41	9	115	26	34	225
	Annual Payroll ($1,000)	E	E	$8,224	E	$3,403	$11,627

Table 548 - Number of Establishments and Annual Payroll ($1,000) for NAICS 44522 in New England, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*

NAICS Code	44522 Fish and Seafood Markets							
Year	**Data**	**New York**	**New Jersey**	**Delaware**	**Maryland**	**North Carolina**	**Virginia**	**Total Mid-Atlantic**
1998	Number of Establishments	302	118	11	65	64	53	311
	Annual Payroll ($1,000)	$15,037	$7,655	E	$6,801	$2,532	E	$16,988
1999	Number of Establishments	297	123	11	65	66	52	317
	Annual Payroll ($1,000)	$16,110	$8,188	$1,123	$7,786	$2,548	E	$19,645
2000	Number of Establishments	307	125	13	71	61	57	327
	Annual Payroll ($1,000)	$17,304	$9,621	E	$8,309	$2,976	$3,262	$24,168
2001	Number of Establishments	323	125	12	78	70	59	344
	Annual Payroll ($1,000)	$18,609	$10,183	$1,243	$8,853	$3,512	$3,104	$26,895

Table 549 - Number of Establishments and Annual Payroll ($1,000) for NAICS 44522 in Mid-Atlantic States, 1998-2001

Data Source: County Business Patterns database
Revenues not adjusted for inflation. ***E*** *=reported as zero, may be in error or <$1,000*

Product Value and Output

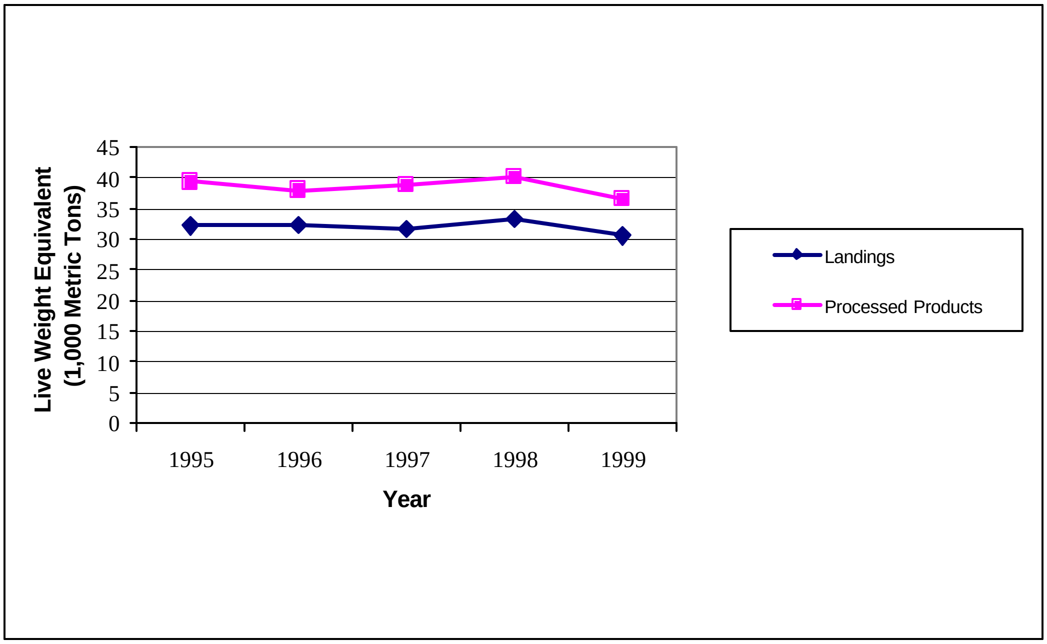


Figure 328 - New England groundfish landings and processed fresh groundfish volume, 1995-1999.
Source Data: NMFS unpublished data. Years denote calendar years.

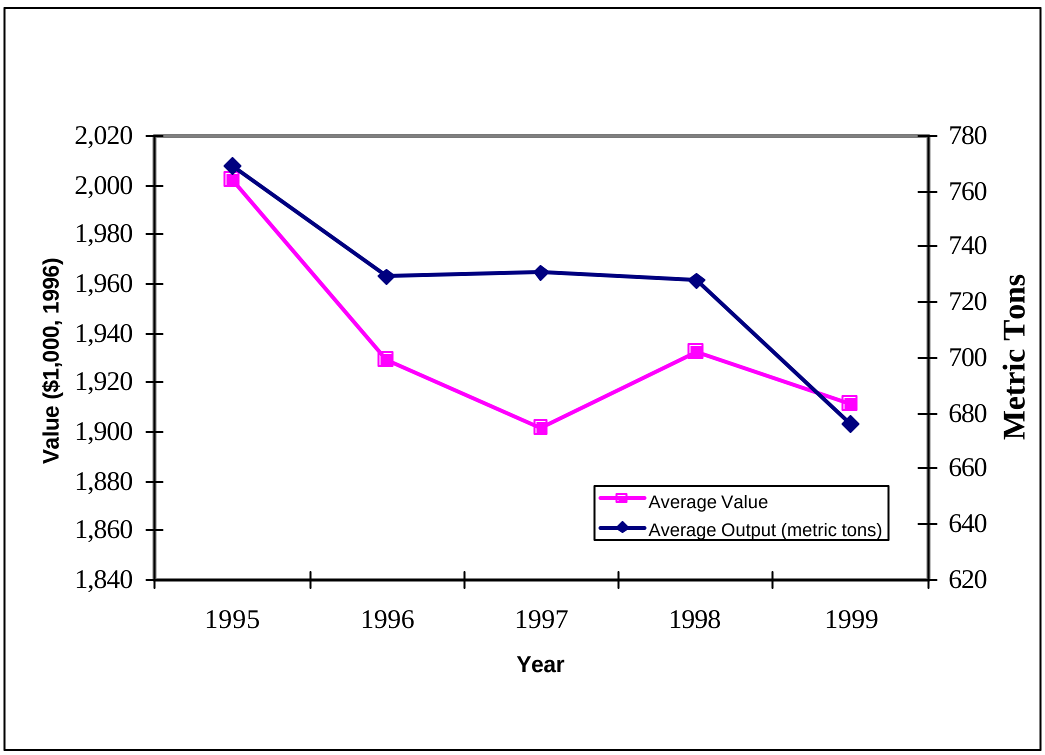


Figure 329 - Average value and output of New England fresh groundfish processed product, 1995-1999.
Source Data: NMFS unpublished data. Years denote calendar years.

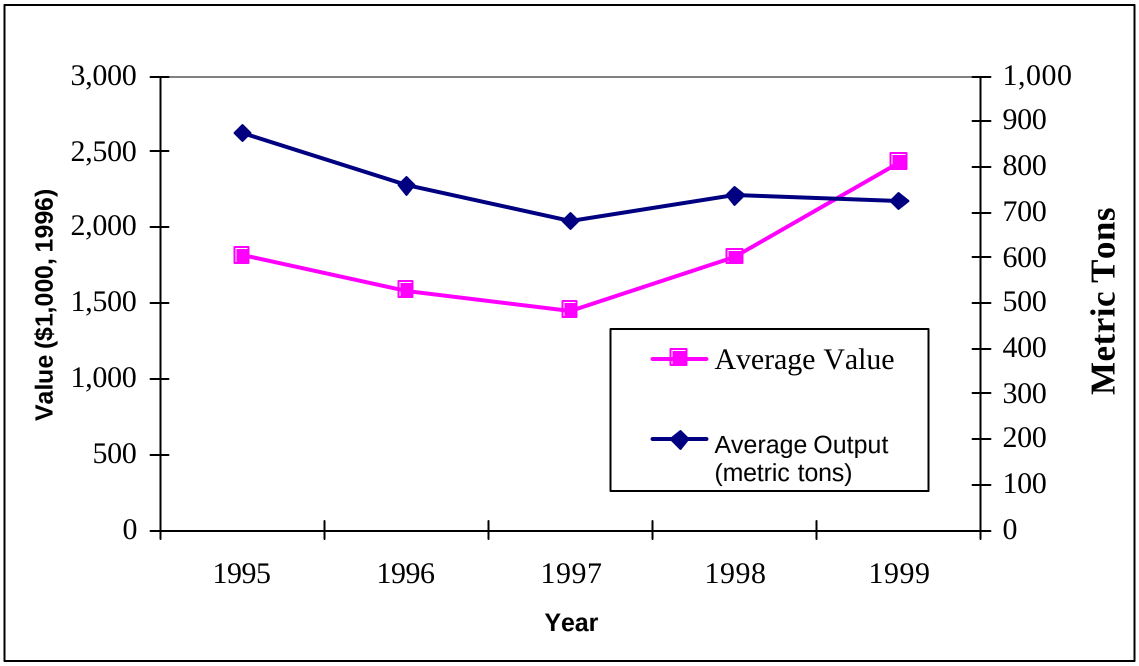


Figure 330 - Average value and output of New England frozen groundfish processed product, 1995-1999.

Source Data: NMFS unpublished data. Years denote calendar years.

Frozen groundfish processing has also declined in the region, and has been similarly impacted by a shortage of groundfish supply. However, most of this has been caused by a decline in Canadian landings after the closure of the Grand Banks to cod fishing in 1991. Rarely, if ever, are New England groundfish landings processed into frozen blocks. As imports of cod blocks declined, imports of pollock blocks increased and processors substituted pollock for cod in the production of breaded cooked fillets, portions and nuggets (Georgianna and Dirlam 2000). Since 1995 the number of frozen groundfish processing plants has remained stable, however, the average output of groundfish products per plant has declined. The average value of production declined until 1997 and then increased to its highest level in 1999, indicating increased demand for these products. Whether this trend will continue is uncertain. According to Georgianna and Dirlam (2000), consumer demand for fish sticks and portions has been declining since the mid-1980s.

As the processing sector diminished, the wholesale sector increased due to opportunistic processors who transferred their attention from the struggling processing sector to wholesaling. Imports of new products have offered profit potential to existing wholesalers and the potential to expand their product line. It is difficult to predict whether the wholesale sector will remain strong if inroads are made by firms that specialize in internet-marketing.

These trends correspond to those described by Georgianna and Dirlam (2000), who concluded the following about the current condition of the processing and wholesale trade sectors in New England:

1. *Boston processing firms have reinforced their position as the leading processing center in New England with all the associated brokerage, packing, transport and wholesaling activities that support processing.*

2. *With the possible exception of Gloucester, processors in other ports have not fared as well as those in Boston. Processors in smaller ports have either disappeared or now supply only small amounts to local customers. The same is true for Portland processors, who have not gained much from the success of the Portland display auction. Some New Bedford processors switched to monkfish, dogfish, and skate when landings of these species increased, selling them to a different set of customers from those that bought groundfish fillets. New Bedford has lost its dominance in flounder production, and Boston firms produce much of the port's fresh groundfish fillets with plants in New Bedford. Gloucester has maintained its small niche in fresh fillet production.*

3. *Long-term relationships or loyalties between processors, their suppliers, and their customers have continued to erode, contributing to the day to day variability of ex-vessel input prices on the one hand, and wholesale prices on the other. As we noted in 1993, when loyalties vanish, hard bargaining takes their place. Although operating and profit margins may not have changed radically on an annualized basis for the firms that still process groundfish, profit margins have become increasingly difficult to maintain in each transaction and over time.*

4. *The survival techniques we noted in 1993, including importing fresh fillets, exploiting niches, substituting for groundfish, focusing more on wholesaling, and closely watching the bottom line, have been extended, and became essential features of successful processors' purchasing and marketing strategies. Whereas in 1993, West Coast whole cod was something of a novelty, many processors today buy frozen whole fish from the West Coast and Alaska as a matter of course. And other new sources have been tapped to replace the shrinking supply of Canadian whole groundfish. As the shortage of the major groundfish species persisted and became accentuated, consumers have become willing to accept domestic and imported substitutes. Those firms that adapted to or promoted the change have been able to diversify their output and maintain volume. Many small processors, however, which were the most dependent on a relatively stable price structure and easy availability of whole groundfish, have not been able to finance the initiation and successful maintenance of these innovative strategies and have quit the industry. The number of processors has, accordingly, continued to decline.*

5. *Boston's advantages in transport costs and clustering far outweigh access to local landings of processors in other ports. Processors at other ports, dependent on local landings, have not found it easy to implement any of these survival strategies.*

6. *As the smaller firms have turned to wholesaling or simply vanished, not only are there fewer, and typically larger firms, but the processors' markets have become even more concentrated than in 1992. Market buying power has not, however, increased to the same extent. As far as we can tell, collusion among a few buyers, if it exists, has not been able to distort the auction process by depressing prices. In the wholesale and retail markets, small-scale customers, such as fish markets, have disappeared due to customer preference for convenience. The larger processing firms now compete among themselves for orders from even larger and more powerful super markets and food service companies. Increasing concentration in this declining market has not given large processing firms market power.*

7. *Though no processor can be said to enjoy an assured supply of whole fish, large firms are better able to draw on widely scattered geographic sources, and adapt to display auctions, now an indispensable source of domestic whole fish. The forces that are reshaping the structure of the processing industry are, therefore, real economies of scale.*

8. *In our previous report, we assumed that increased supplies of underutilized species such as monkfish, skate, and dogfish would very likely lead to intense price competition for a small share of established markets. This did not occur. Demand expanded for these and other species, followed by intensive fishing and then stock declines. These formerly underutilized stocks are now severely depleted, and U.S. Department of Commerce is preparing restrictive management plans for these species.*

9. *In our previous report, we observed an increase in the number of wholesaling firms and wholesaling employment, which we attributed to some firms switching from cutting fillets to simply buying and selling whole fish or previously processed fillets. We predicted that many of these entries into wholesaling were temporary, because some of the firms that switched from processing to wholesaling could not survive competitive pressure in the wholesaling sector. There is some but not conclusive evidence for this. Massachusetts Division of Employment and Training data show a decline in the rate of increase in the number of firms and an absolute decline in wholesaling employment.*

10. *An increase in groundfish stocks and landings resulting from stock recovery, could stabilize or may even reverse declines in employment and in the number of processing firms. Many of the changes in structure of groundfish processing due to supply shortages, for example, the dominance of Boston firms, the growing importance of display auctions, and weakened customer loyalty, will probably not be affected by increases in landings, when and if stocks recover.*

9.4.5 Fishing Community Information

9.4.5.1 Defining a Fishing Community

National Standard 8 requires the consideration of impacts on fishery dependent communities, where a fishing community is "a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community." Current guidance on National Standard 8 specifies that communities are place-based: geographic units such as towns and cities that might fit the Census Bureau's definition of a "place." But actual methodological guidelines are still in the process of refinement and resources have not been directed towards the systematic and long-term collection of the kinds of baseline data needed to make such determinations in an empirically grounded way. For example, the weigh-out data and the permit files document landing and home ports, but these are not necessarily the same places where people live, where specific styles of and knowledge about fishing are practiced, or where the impacts of management are most strongly felt. It is important to note that fishing communities are not bounded or separated from the commerce and institutional apparatus of the larger cities and towns in which they are located. In fact, most fishing communities rely on a rather complicated network of business and social ties that extend well beyond the boundaries of their communities and often into other communities in the region.

In terms of the keywords "substantially dependent" and "substantially engaged," some have suggested, for example, that "substantial dependence" be measured in terms similar to the U.S. Department of Agriculture's criteria for determining whether rural communities are dependent on agriculture or logging. The Economic Research Service of the USDA, for example, classifies counties as farming dependent given a certain percentage of economic activity, in this case labor and proprietor income. Some of the sources of data to consider in making determinations of fishing dependence are thus supplied in current guidance, such as landings information or numbers of participants, and the sociocultural importance of the fishery. With respect to determining whether a community is "substantially engaged" in the harvesting or processing of a fishery, existing guidance does not provide clear criteria. While the application of a percentage of economic income activity may be an appropriate way to determine "substantial dependence", there may be other valid criteria for determining "substantial dependence." For example, it could be based on some minimum absolute level of activity (such as landings, number of vessels, etc.), or the presence of particular type of infrastructure (auctions, co-ops, state fish piers), or level of fishing activity (revenues, landings in weight, time spent fishing) that indicate a community is "substantially engaged" in fishing. This approach is used in this document to identify fishing communities that are "substantially engaged" in fishing.

This AHE and the SIA also discuss ports and groups based on gear or other characteristics in order to meet the requirements of the fishery impact statements to examine the impacts to all the individuals, communities, and other groups that participate in the fishery. However, assessment of the impacts of the measures proposed in this amendment includes not only those communities that meet the strict interpretation of fishing communities, but also other ports or port groups that will certainly experience impacts from the proposed action, for the impacts of Amendment 13 are predicted to be large in scale, affecting most places engaged in the groundfish fishery. Not all of these port groups necessarily meet the legal definition of a fishing community as promulgated through National Standard 8, which can be considered a subset of the broader ports and groups involved in the groundfish fishery. The Northeast Region has begun to make some headway in collecting the kinds of information and performing the kinds of analyses to support National Standard 8 determinations, most notably the Marine Fisheries Initiative (MARFIN) project on fishing communities and fishing dependency in New England (Hall-Arber, *et. al* 2001) and an updated port-profiles report for the Mid-Atlantic (McCay and Cieri, 2000). While some of these efforts include discussions of communities at larger levels than a "place," they still usefully provide context and background for understanding the impacts that fishing communities defined by National Standard 8 might experience. However, they do not identify all the fishing dependent communities that may require action under National Standard 8, an exercise which is still in progress. The SIA does, however, identify fishing communities based on a criteria for determining they are "substantially engaged" in harvesting or processing fish.

9.4.5.2 Identification of Amendment 13 Community Groups

In this amendment, coastal communities throughout the Northeast region are organized into primary and secondary *port groups* based on participation in the groundfish fishery since the 1994 fishing year. The port groups are assembled in such a way that additional information about them can be obtained by cross-referencing information about the sub-regions in the MARFIN Report (see 0 for a description of the MARFIN Report). The port groups identified in this document are essentially subsets of the sub-regions identified in the MARFIN Report. Since social and demographic statistics are often compiled at the county level, the port groups are divided by county or adjacent counties, depending on how the MARFIN sub-regions are structured, so that county-level data may be used to characterize changes in these communities and ports.

The port groups in this document are separated into primary and secondary groups. ***Primary groups*** are those communities that are substantially engaged in the groundfish fishery, as explained above, and which are likely to be the most impacted by groundfish management measures. ***Secondary groups*** are those communities that may not be substantially dependent or engaged in the groundfish fishery, but have demonstrated some participation in the groundfish fishery since the 1994 fishing year (FY94). Because of the size and diversity of the groundfish fishery, it is not practical to examine each secondary port individually, which is why most secondary ports are grouped with others in the same county or in geographically adjacent counties.

To identify primary and secondary port groups, groundfish landings by port were examined for the time period 1994-1999 from the dealer weighout database. Primary port groups represent the most active ports (currently) in the groundfish fishery and were selected based on groundfish landings greater than one million pounds annually since 1994 and/or the presence of significant groundfish infrastructure (auctions and co-ops, for example). In this Amendment and in the absence of specific guidance, these ports are considered fishing communities (as defined by the MSFCMA) because they have demonstrated a continued substantial engagement in fishing, here in particular the groundfish fishery. Secondary port groups consist of groups of ports in which some level of groundfish activity has been observed since 1994. This approach provides a way to consider the impacts of the Amendment 13 management measures on every port in which some amount of groundfish has been landed since 1994, and identifies some as fishing communities (as defined by NS8) based on substantial engagement. Though the analysis does not identify those fishing communities that meet the "substantial dependence" criteria, it is unlikely that the analysis misses any port which may be a fishing community based on the substantial dependence criteria because the impacts of the amendment are considered on nearly every port that has groundfish activity,.

It is important to remember that because significant geographical shifts in the distribution of groundfish fishing activity have already occurred, the characterization of some ports as primary or secondary ports may not reflect their historical participation in and dependence on the groundfish fishery. A good example is Rockland, Maine. Historically, Rockland would have been considered a primary groundfish port, landing large quantities of redfish, flounders, and other groundfish, and serving as an important groundfish processing port, and would have met the test for "substantial engagement." In recent years, however (since the establishment of the Hague Line in 1984 and the decline of groundfish stocks in the early 1990s), fishing activity in Rockland has shifted from groundfish to other species like lobster and herring. This also reflects the apparent concentration of the groundfish fishery around Portland, Maine and the loss of the fishery to many coastal communities in northern Maine.

The outline below lists the Amendment 13 primary and secondary port groups. Additional information about each of these groups appears in the following subsections. Primary multispecies ports are considered fishing communities under NS8.

I. DOWNEAST MAINE – WASHINGTON COUNTY

A. Primary Multispecies Port
1. None

B. Secondary Multispecies Ports
1. Downeast Maine: Jonesport, West Jonesport, Beals Island, Milbridge, Machias, Eastport, and Dyers Bay

II. UPPER MID-COAST MAINE – HANCOCK, WALDO, AND KNOX COUNTIES

A. Primary Multispecies Ports
1. None

B. Secondary Multispecies Communities
1. Upper Mid-Coast 1: Rockland, Port Clyde, Sprucehead, Owls Head, Friendship, Friendship Harbor, Camden, and Vinalhaven
2. Upper Mid-Coast 2: Stonington and Sunshine/Deer Isle
3. Upper Mid-Coast 3: Winter Harbor, Southwest Harbor, Bar Harbor, Northeast Harbor, and Northwest Harbor

III. LOWER MID-COAST MAINE – LINCOLN, SAGADAHOC, AND CUMBERLAND COUNTIES

A. Primary Multispecies Ports
1. Portland

B. Secondary Multispecies Ports
1. Lower Mid-Coast 1: New Harbor, Bristol, South Bristol, Boothbay Harbor, East Boothbay, Medomak, Southport, and Westport
2. Lower Mid-Coast 2: Cundys Harbor, Orrs Island, Yarmouth, Harpswell, East Harpswell, South Harpswell, Bailey Island, and Cape Elizabeth
3. Lower Mid-Coast 3: Sebasco Estates, Small Point, West Point, Five Islands, and Phippsburg

IV. SOUTHERN MAINE – YORK COUNTY

A. Primary Multispecies Ports
1. None

B. Secondary Multispecies Ports
1. Southern Maine: York, York Harbor, Camp Ellis, Kennebunkport, Kittery, Cape Porpoise, Ogunquit, Saco, and Wells

V. OTHER MAINE – all other coastal Ports in Maine

VI. STATE OF NEW HAMPSHIRE – ROCKINGHAM AND STRAFFORD COUNTIES

A. Primary Multispecies Ports
1. Portsmouth

B. Secondary Multispecies Ports
1. NH Seacoast: Rye, Hampton/Seabrook, Hampton, and Seabrook

VII. OTHER NEW HAMPSHIRE – all other coastal Ports in New Hampshire

VIII. GLOUCESTER AND NORTH SHORE – ESSEX COUNTY

A. Primary Multispecies Ports

1. Gloucester

B. Secondary Multispecies Ports

1. The North Shore: Rockport, Newburyport, Beverly/Salem, Beverly, Salem, Marblehead, Manchester, and Swampscott

IX. BOSTON AND SOUTH SHORE – MIDDLESEX, SUFFOLK, NORFOLK, AND PLYMOUTH COUNTIES

A. Primary Multispecies Ports

1. Boston

B. Secondary Multispecies Ports

1. The South Shore: Scituate, Plymouth, and Marshfield (Green Harbor)

X. CAPE AND ISLANDS – BARNSTABLE, DUKES, AND NANTUCKET COUNTIES

A. Primary Multispecies Ports

1. Chatham/Harwichport

B. Secondary Multispecies Ports

1. Provincetown
2. Other Cape Cod: Sandwich, Barnstable, Wellfleet, Woods Hole, Yarmouth, Orleans, and Eastham
3. The Islands: Nantucket, Oak Bluffs, Tisbury, and Edgartown

XI. NEW BEDFORD COAST – BRISTOL COUNTY

A. Primary Multispecies Ports

1. New Bedford/Fairhaven

B. Secondary Multispecies Ports

1. Other Bristol County: Dartmouth, and Westport

XII. OTHER MASSACHUSETTS – all other coastal Ports in Massachusetts

XIII. STATE OF RHODE ISLAND – WASHINGTON AND NEWPORT COUNTIES

A. Primary Multispecies Ports

1. Point Judith

B. Secondary Multispecies Ports

1. Western RI: Charlestown, Westerly, South Kingstown (Wakefield), and North Kingstown (Wickford)
2. Eastern RI: Newport, Tiverton, Portsmouth, Jamestown, Middletown, and Little Compton

XIV. OTHER RHODE ISLAND – all other coastal Ports in Rhode Island

XV. STATE OF CONNECTICUT – NEW LONDON, MIDDLESEX, NEW HAVEN, AND FAIRFIELD COUNTIES

A. Primary Multispecies Ports

1. None

B. Secondary Multispecies Ports

1. Coastal CT: Stonington, New London, Noank, Lyme, Old Lyme, East Lyme, Groton, and Waterford

XVI. OTHER CONNECTICUT – all other coastal Ports in Connecticut

XVII. LONG ISLAND, NEW YORK – SUFFOLK, NASSAU, QUEENS, AND KINGS COUNTIES

A. Primary Multispecies Ports
   1. Eastern Long Island: Montauk, Hampton Bay, Shinnecock, and Greenport

B. Secondary Multispecies Ports
   1. Other Long Island: Mattituck, Islip, Freeport, Brooklyn, Other Nassau County, and Other Suffolk County

XVIII. OTHER NEW YORK – all other coastal Ports in New York

XIX. NORTHERN COASTAL NEW JERSEY – MONMOUTH AND OCEAN COUNTIES

A. Primary Multispecies Ports
   1. None

B. Secondary Multispecies Ports
   1. Northern Coastal NJ: Point Pleasant, Belford, Long Beach/Barnegat Light, Barnegat, Highlands, Belmar, Sea Bright, and Manasquan

XX. SOUTHERN COASTAL NEW JERSEY – ATLANTIC AND CAPE MAY COUNTIES

A. Primary Multispecies Ports
   1. None

B. Secondary Multispecies Ports
   1. Southern Coastal NJ: Cape May, Wildwood, Burleigh, Sea Isle City, Ocean City, Stone Harbor, and Avalon

XXI. OTHER NEW JERSEY – all other coastal Ports in New Jersey

XXII. DELAWARE

XXIII. MARYLAND

XXIV. VIRGINIA

XXV. NORTH CAROLINA

9.4.5.3 Available Information

New information about the ports involved in multispecies fisheries has been made available since Amendment 7 and is utilized to the extent possible to analyze the impacts of the management alternatives under consideration in Amendment 13.

While it is not practical to include all of the newly available social and community information in this document, appropriate references are included in the various sub-sections for each community group so that readers and reviewers can access any additional materials in which they are interested. Most of these additional materials can be obtained by contacting the Council office.

Council Staff Initiatives

To improve the quantity and quality of social and economic data available for analyzing the impacts of groundfish management measures, the New England Fishery Management Council staff conducted a comprehensive query of fishery data for multispecies permit holders and hosted a series of ten social impact informational meetings throughout the region. Fishery data were gathered for multispecies permit holders from the permit, logbook, and dealer databases to generate a comprehensive database that provides fishery information (landings and revenues) from the 1994 fishing year to present by species group, multispecies permit category, vessel size, gear type, and port. These data were used to develop the description of the commercial harvesting sector in this document. These data will also be used in the Amendment 13 FSEIS to characterize fishing activity in the identified community groups.

The Social Impact Informational Meetings were intended to provide an opportunity to retrospectively discuss the social impacts of groundfish regulations since Amendment 5 with residents of affected fishing ports. Through this process, qualitative social impact information was obtained from more than 300 residents of affected fishing ports. In addition, a total of 61 comment sheets and four written letters were received from November 1, 2000 – January 7, 2001. This information was summarized and presented in a report from Council staff, which is referenced in this document. The information gleaned from the social impact informational meetings was derived from a non-representative sample of participants who chose to attend the meetings, which therefore cannot be considered necessarily representative of the views of all groups of stakeholders. However, this information can be used to identify general trends and perceptions of impacts.

Other Initiatives

Madeleine Hall-Arbor et al. received funding for a cooperative research project funded by the Saltonstall-Kennedy program and the Northeast Consortium. The program uses "community-based panels" composed of knowledgeable residents to provide socioeconomic information about the situation in which they live. While the results collected from community panel meetings should be considered non-random data (if the membership varies from meeting to meeting, and participants comprising the panels in each location do not necessarily represent the interests of all stakeholder groups), these panels may ultimately provide new/additional community information, review available information for accuracy and comprehensiveness, and provide insight useful for social impact assessment and resource management decision-making. In its early stages, a pilot program was funded for the communities of Gloucester, Downeast Maine, and South Shore of Massachusetts. Additional funding has recently been obtained to establish panels in Chatham and New Bedford, MA and Point Judith, RI.

A preliminary report for the panels project is included in the public comment section of this document. The themes of this initial report include concern over long-term regulatory impacts, lack of flexibility, impact on vessel condition/safety, impacts on shoreside businesses (infrastructure), impacts on supply and prices, economic costs, concerns and visions for the future. Gloucester panel members expressed concern over a likely domino effect that would occur to the commercial infrastructure resulting from cutbacks due to Amendment 13. Further concerns include a future inability to harvest stocks once they are rebuilt. The report on commercial infrastructure, although prepared by the Gloucester panel, is relevant for other ports concerned about the consequences of loss of commercial waterfront.

MARFIN and Other Community Profiles

Madeleine Hall-Arber et al. recently completed a report entitled, "*Fishing Communities and Fishing Dependency in the Northeast Region of the United States*" as part of a grant received through the Marine Fisheries Initiative (MARFIN). This MARFIN Report serves to lay the groundwork for regional and community data sharing among managers, fishing industry participants, and fishing communities. One unique feature of the MARFIN Report is that it attempts to characterize and quantify fishing dependence in various coastal communities. Measuring fishing dependence is complicated and requires consideration of fishing history, infrastructure, social institution, gentrification, etc.. These and other issues are described in the MARFIN Report.

While it is not practical to include the MARFIN Report as part of the Amendment 13 document (it is more than 400 pages), it should be noted that the MARFIN Report serves as an important reference for Amendment 13. Much of the community information presented in the MARFIN Report was referenced and utilized to the extent possible in the analyses and should be referenced accordingly in the review of this document. It is noted in the subsections below when additional information can be obtained by referencing the MARFIN Report as well as other relevant materials.

The MARFIN Report updates economic, social, and cultural data for fishing communities in New England (Maine – Connecticut), but does not include Mid-Atlantic states. Bonnie McCay et al. recently received funding to conduct similar research for the Mid-Atlantic states. McCay et al. propose to use demographic, ethnographic, survey, and participatory methods to develop community profiles for Mid-Atlantic fishing communities that are comparable in structure and scope to those used by Hall-Arber et al. This, combined with the MARFIN Report for the New England states, should provide a baseline database that can be used to assess the impacts of changes in the regulatory environment on fisheries and fishing communities now and in the future. Since the MARFIN and McCay et al. work is intended to represent a starting point for the systematic collection of social and community information, the data should be updated regularly as more information becomes available. The McCay et al. research is currently underway, and if available, will be included in the Final EIS for Amendment 13.

McCay and Cieri did recently complete general updates to port profiles for the Mid-Atlantic region as work funded by the Mid-Atlantic Council (McCay and Cieri, 2000). Resources were limited, but McCay and Cieri utilized NMFS landings data, 1990 census information, brief visits to ports and interviews with key informants, and other materials where available to characterize fishing ports in the Mid-Atlantic region. This information will serve as the most recent information for these ports until additional work is completed. Again, while it is not practical to include this report as part of the document, it should be noted that this report serves as an important reference and was utilized to the extent possible for Amendment 13 analyses. It is noted in the subsections below when additional information can be obtained by referencing the McCay and Cieri 2000 report.

Two additional reports containing social information and fishing community profiles serve as useful references for this document:

In October 1996, Aguirre International completed a report entitled, *An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in New England and the Mid-Atlantic Regions*. This report was intended to be the result of the first phase of a comprehensive assessment of the social and cultural characteristics of fishing communities involved in the multispecies fishery. The recently completed MARFIN Report builds on the information presented in the Aguirre Report and includes more information about dependence, gentrification, and other important issues. However, the Aguirre Report is still useful for some historic information and for a snapshot of some fishing communities around the time of implementation of Amendments 5 and 7. The communities profiled in the Aguirre Report include:

- **Primary Ports:** Portland, ME; Gloucester, MA; Chatham, MA; New Bedford, MA; Point Judith, RI
- **Secondary Ports:** Stonington and Downeast, ME; Portsmouth, NH and southern Maine ports; Provincetown, MA; Newport, RI; Montauk, NY; Ocean City, MD; Tidewater, VA; Wanchese, NC.

Bonnie McCay et al. completed a report for the Mid-Atlantic Council detailing aspects of fishing communities in the Mid-Atlantic region in December 1993. This report was intended to serve as a source document for social and economic impact assessments and contains useful information about the fisheries in which vessels in these communities participate. While it does not include much social and community information (demographics, cultural information, etc.), the economic and fisheries information is helpful to characterize communities' involvement in and dependence on various fisheries, including the multispecies fishery. The report provides information on communities throughout the Mid-Atlantic area, including ports in New York, New Jersey, and Rhode Island, as well as Stonington, CT, New Bedford and Chatham, MA, Wanchese, NC, Ocean City, MD, and Hampton Roads, VA.

9.4.5.4 Conservation Law Foundation et al. v. Evans (Framework 33 Lawsuit)

Section 9.4.2.4.6 summarizes the potential cumulative impacts of the gear restrictions and area closures implemented through the settlement agreement on groundfish fishing activity based on port of landing in FY2000. Groundfish landings in some smaller ports, especially in Maine, are predicted to be affected 100%. Other ports with landings that are likely to be most significantly affected include Gloucester MA, Newburyport MA, Provincetown MA, Newport RI, Point Judith RI, New London CT, Stonington CT, and almost all major ports in New York and New Jersey. These impacts are based on observed landings in FY2000; actual impacts will depend on the ability of fishermen in the affected communities to find new areas in which to fish and adapt to the gear restrictions.

State	Port Landed	No. of vessels	% of total groundfish affected	Total groundfish landed	State	Port Landed	No. of vessels	% of total groundfish affected	Total groundfish landed
Maine	Bar Harbor	4	**100.0**	150,529	Massachusetts	New Bedford	150	**73.3**	30,729,098
	Boothbay Harbor	4	**79.3**	156,550		Newburyport	12	**85.5**	370,398
	Cape Porpoise	5	**100.0**	134,784		Plymouth	9	**48.7**	401,827
	Port Clyde	13	**80.4**	1,037,660		Provincetown	37	**77.0**	2,258,782
	Portland	104	**84.9**	12,819,616		Rockport	9	**56.6**	273,106
	Rockland	6	**91.9**	262,679		Sandwich	7	**18.7**	278,367
	South Bristol	13	**96.7**	578,293		Scituate	22	**49.1**	1,084,848
	York	4	**97.3**	100,116	Rhode Island	Newport	36	**80.2**	2,541,745
New Hampshire	Hampton	5	**52.3**	273,367		Point Judith	85	**82.7**	12,727,794
	Portsmouth	35	**77.2**	2,058,041		Tiverton	5	**24.6**	151,368
	Rye	9	**46.3**	612,536	Connecticut	New London	4	**99.0**	2,892,489
	Seabrook	21	**77.5**	960,910		Stonington	18	**79.9**	2,681,518
Massachusetts	Barnstable	5	**7.1**	291,922	New York	Freeport	6	**96.5**	128,423
	Boston	14	**83.2**	3,471,624		Greenport	6	**89.2**	247,169
	Chatham	52	**50.3**	4,603,028		Hampton Bays	4	**91.5**	666,657
	Gloucester	166	**84.5**	15,212,821		Montauk	31	**86.0**	4,376,822
	Green Harbor	5	**49.7**	101,723		Point Lookout	3	**97.2**	512,461
	Harwichport	16	**42.6**	1,705,324		Shinnecock	45	**71.7**	1,680,614
	Marblehead	3	**37.9**	259,356	New Jersey	Belford	15	**97.2**	658,867
	Marshfield	6	**18.1**	278,561		Point Pleasant	20	**64.0**	1,160,630
	Nantucket	29	**73.4**	684,750					

Table 550 Total Affected Groundfish Activity from the Mesh Restrictions and Area Closures Implemented in the NMFS Interim Action

Source: NMFS Interim Action EA, June 2002, Table 6.30. Information is based on the 2000 fishing year.

9.4.5.5 Data Sources and Caveats

9.4.5.5.1 Landings and Revenues

Landings and Revenues By Port of Landing

Landings and revenues by multispecies permit holders as reported in the dealer weighout database are summarized in each section. These data are reported by dealers based on the area in which the fish were landed. This information is useful for characterizing the fishing activity occurring in specific ports and regions, as well as the relative importance of the areas as groundfish ports of landing. These data only reflect fishing activity by multispecies permits holders.

Total number of active multispecies vessels as reported in each Port of Landing section in the following discussion represents the total number of vessels holding multispecies permits and landing fish. For every given year, a certain number of these vessels did not demonstrate activity in the multispecies fishery. Total active multispecies vessels are associated with total landings, while multispecies vessels landing groundfish are associated with groundfish landings. The number of active multispecies vessels landing groundfish are a subset of the total number of active multispecies vessels, and represent the group of vessels that reported landings of groundfish in a particular region, county, or port.

Landings and revenues are reported for each port group and fishing community and grouped in the following categories:

- **Groundfish** includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.
- **Small Mesh Multispecies** includes silver hake, red hake, offshore hake, and ocean pout.
- **Small Mesh Non-Multispecies** includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.
- **Other Species** includes monkfish, fluke, dogfish, skates, cusk and all other species.
- **High Value Species** includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

Landings and revenues for less than three vessels were not reported for confidentiality reasons.

Landings and Revenues By Homeport

Fishing activity by permitted multispecies vessels is also summarized by home port. Home port, as described in the commercial harvesting section, home port is indicated on the permit and represents the port and state in which the associated vessel resides. The data were generated through a combination of the permit and dealer weighout databases. Two assumptions are made when examining these data:

1. Owners/captains of the vessels homeported in the community group live in the community group as well.
2. Revenues from the vessels homeported in the community group are returned to that same community group, no matter where the fish are landed and sold.

To the extent that the above assumptions hold true, these data better reflect the community's participation in and dependence on the multispecies fishery. For this discussion, dependence is defined as multispecies revenues as a percentage of total revenues from federally permitted vessels in a particular region, county, or port. For years in which fewer than three vessels reported groundfish landings, dependence was not reported as an exact percentage. Instead, the values calculated were rounded to nearest whole percentage points and reported as estimates. Again, these data do not reflect activity for vessels that do not possess any federal permits. As for data reported by port of landing, landings and revenues by home port were not reported for less than three vessels for confidentiality reasons.

The number of permitted multispecies vessels reported in each Homeport section represents the total number of vessels with multispecies permits, *including inactive vessels which did not report landings of any species*. The number of active vessels associated with total landings and revenues and groundfish-only landings and revenues are also reported. Again, the number of permitted multispecies vessels homeported in a particular place and reporting groundfish landings is low compared to the number of permitted multispecies vessels landing *any* species or the total number of vessels with multispecies permits.

9.4.5.5.2 U.S. Census

The decennial U.S. census, taken by the Census Bureau in years ending in 0 (zero), is a comprehensive census of population and housing in the United States. Article I of the Constitution requires that a census be taken every ten years for the purpose of reapportioning the U.S. House of Representatives. 1990 and 2000 census data are reported here to show changes in population, educational attainment, poverty and unemployment for counties within each port group. Population by race in each county is shown for 2000 only.

9.4.5.5.3 Fishing Industry Employment Data

Data on employment in the fishing industry is reported by North American Industry Classification System (NAICS) sectors for each county. Two databases provide data on number of establishments (businesses), annual payroll and other relevant information on business activity in specific industry sectors. These are the County Business Patterns and Nonemployer Statistics. Both databases use the same industry classification codes, described below.

North American Industry Classification System (NAICS)
The North American Industry Classification System was developed by representatives from the United States, Canada, and Mexico, and replaces each country's separate classification systems with one uniform system for classifying industries. In the United States, NAICS replaces the Standard Industrial Classification (SIC), a system that federal, state, and local governments, the business community, and the general public used from the 1930s until 1998.

Data on NAICS Sector 1141 (Fishing) was derived from the Nonemployer Statistics database, while data on NAICS Sectors 3117 (Seafood product preparation and packaging), 311711 (Seafood canning), 311712 (Fresh and frozen seafood processing), 42246 (Fish and seafood wholesaler), and 44522 (Fish and seafood markets) was taken from the County Business Patterns database. While CBP provides information on the Fishing sector, these data substantially underestimate the number of participants in fish harvesting industry, due to the large number of self-employed individuals. Likewise, the number of employers reported in the Nonemployer Statistics within the seafood processing, packaging, sales and marketing sectors is far lower than the actual number of active businesses, since most of these are incorporated businesses and thus would not be considered nonemployers.

The following industry sectors are discussed in relation to fishing communities and port groups that will be affected by Amendment 13. These NAICS code descriptions are provided by the U.S. Census Bureau:

NAICS 1141: Fishing
This industry comprises establishments primarily engaged in the commercial catching or taking of finfish, shellfish, or miscellaneous marine products from a natural habitat, such as the catching of bluefish, eels, salmon, tuna, clams, crabs, lobsters, mussels, oysters, shrimp, frogs, sea urchins, and turtles.
Data source in Amendment 13: Nonemployer Statistics

NAICS 3117: Seafood Product Preparation and Packaging
This NAICS Industry Group includes establishments classified in NAICS Industry 31171, Seafood Product Preparation and Packaging. Note that Industry Sectors 311711 (Seafood Canning) and 311712 (Fresh and Frozen Seafood Processing) are subsets of 3117.
Data source in Amendment 13: County Business Patterns

NAICS 31171: Seafood Product Preparation and Packaging
This industry comprises establishments primarily engaged in one or more of the following: (1) canning seafood (including soup); (2) smoking, salting, and drying seafoods; (3) eviscerating fresh fish by removing heads, fins, scales, bones, and entrails; (4) shucking and packing fresh shellfish; (5) processing marine fats and oils; and (6) freezing seafood. Establishments known as "floating factory ships" that are engaged in the gathering and processing of seafood into canned seafood products are included in this industry.
Data source in Amendment 13: County Business Patterns

NAICS 4224: Grocery and related product wholesalers
This NAICS Industry Group includes establishments classified in the following NAICS Industries: 42241, General line grocery wholesalers; 42242, Packaged frozen food wholesalers; 42243, Dairy product (except dried or canned) wholesalers; 42244, Poultry and poultry product wholesalers; 42245, Confectionery wholesalers; **42246, Fish and seafood wholesalers**; 42247, Meat and meat product wholesalers; 42248, Fresh fruit and vegetable wholesalers; 42249, Other grocery and related products wholesalers.
Data source in Amendment 13: County Business Patterns

NAICS 44522: Fish and Seafood Markets
This industry comprises establishments primarily engaged in retailing fresh, frozen, or cured fish and seafood products.
Data source in Amendment 13: County Business Patterns

9.4.5.5.3.1 County Business Patterns

County Business Patterns provides data on the total number of establishments, mid-March employment, first quarter and annual payroll, and number of establishments by nine employment-size classes by detailed industry for all counties in the United States and the District of Columbia.

CBP data are extracted from the Business Register, the Census Bureau's file of all known single and multiestablishment companies. The Annual Company Organization Survey and quinquennial Economic Censuses provide individual establishment data for multi-location firms. Data for single-location firms are obtained from various programs conducted by the Census Bureau, such as the Economic Censuses, the Annual Survey of Manufactures, and Current Business Surveys, as well as from administrative records of the Internal Revenue Service (IRS), the Social Security Administration (SSA), and the Bureau of Labor Statistics (BLS).

An establishment is a single physical location at which business is conducted or services or industrial operations are performed. It is not necessarily identical with a company or enterprise, which may consist of one or more establishments. When two or more activities are carried on at a single location under a single ownership, all activities generally are grouped together as a single establishment. The entire establishment is classified on the basis of its major activity and all data are included in that classification.

Total payroll includes all forms of compensation, such as salaries, wages, reported tips, commissions, bonuses, vacation allowances, sick-leave pay, employee contributions to qualified pension plans, and the value of taxable fringe benefits. Payroll is reported before deductions for Social Security, income tax, insurance, union dues, etc.

9.4.5.5.3.2 Nonemployer Statistics

Nonemployer Statistics summarizes the number of establishments and sales or receipts of companies with no paid employees. These nonemployers are typically self-employed individuals or partnerships operating businesses that they have not chosen to incorporate. A nonemployer business is one that has no paid employees, has annual business receipts of $1,000 or more ($1 or more in the construction industries), and is subject to federal income taxes. (Self-employed owners of incorporated businesses typically pay themselves wages or salary, so that the business is an employer.) Nonemployers do not get census questionnaires and are not reflected in any of the other Core Business Statistics reports or detailed sector-specific reports.

The universe of nonemployer establishments is created annually, in part, as a by-product of identifying the Census Bureau's business employer universe. The business employer universe is known as the Business Register. The Business Register attempts to cover all businesses in the United States with paid employees. If the Census Bureau receives information about a particular business establishment through administrative records, but does not receive any indication that it has paid employees, it becomes part of the potential nonemployer universe. Name, address, industry classification, and receipts are available for each potential nonemployer record. These data are obtained chiefly from the annual business income tax returns filed with the Internal Revenue Service (IRS).

All of the Agriculture, Forestry, Fishing, and Hunting sector, except crop and animal production, are covered in nonemployer statistics; these industries typically are not covered in other Census Bureau economic programs.

In accordance with U.S. Code, Title 13, Section 9, no data are published that would disclose the operations of an individual business. For U.S.- and state-level data, the number of establishments and receipts in a data cell is published only if it contains three or more nonemployer businesses. For county- and MSA-level data, the number of establishments and receipts in a data cell is published only if it contains ten or more nonemployer businesses. According to Census Bureau disclosure rules, when a small number of nonemployer businesses have a dominant share of receipts in a data cell, establishments and receipts are suppressed to protect the dominant businesses.

Receipts includes gross receipts, sales, commissions, and income from trades and businesses, as reported on annual business income tax returns. Business income consists of all payments for services rendered by nonemployer businesses, such as payments received as independent agents and contractors.

Generally, an establishment is a single physical location at which business is conducted or services or industrial operations are performed. However for nonemployers, each distinct business income tax return filed by a nonemployer business is counted as an establishment.

9.4.5.6 Maine

This section summarizes available information about fishing communities in the state of Maine and includes references to the appropriate documents, which are not included as part of this document.

In 1998, the Maine Department of Marine Resources (ME DMR) contracted for a series of focus group meetings to discuss the impacts of Amendments 5 and 7 on various communities throughout the state. Focus group meetings were conducted in Portland, Wiscasset, Rockland, Stonington, and Jonesport, and the report from these meetings is included as part of an overall report entitled, *Perspectives from Five Ports: Impacts of Amendments 5 and 7 to the Northeast Multispecies Fishery Management Plan*. This report provides some useful information about these communities, including perspectives from residents in the communities about the impacts of Amendments 5 and 7. The larger report also includes information about this history of Maine's groundfish fishery, economic aspects of the fishery, the composition of Maine's fishing fleet, the role of the Portland Fish Exchange, support from the city of Portland, and the performance of Maine's groundfish industry over time.

Health care and the ability for the fishing industry to find and keep affordable health insurance is an important social issue. In the Spring of 1999, Caritas Christi Health Care System funded the development of a report entitled, *Health Survey of the Fishing Population in Maine*. The survey project in the state of Maine was part of a regional effort to determine the need for more affordable heath insurance for fishing families. It was initiated by leaders in the Massachusetts Fishermen's Partnership and was part of a continuing effort to expand the benefits of the Fishing Partnership Health Plan to other states in the region. A random sample of 2,500 permit holders in the state were selected for the survey, and 168 surveys were returned, providing information on 308 adults and 169 children. The survey was conducted in the Summer of 1998, and based on the results, approximately 44% of the fish harvesting population in the state were without health insurance at that time. This Report can be referenced for additional important information about fishing families in many communities throughout Maine, including information about employment and household characteristics, health insurance status, cost of health care, and other information related to the use of health services.

ME DMR completed a report in 2001 detailing a developmental strategy for the Maine seafood industry, which also provides additional useful socio-economic information. This report, entitled, *Maine Seafood Harvesting and Processing: A Developmental Strategy*, was intended to serve not only as a reference for impact assessments, but also for Maine's Joint Standing Committee on Business and Economic Development. It presents information about the fishing industry in Maine and provides the industry's perspectives on the barriers and opportunities for future growth in the state. The report provides a useful overview of Maine's most important fisheries; recommendations in the report are not those of ME DMR, but of residents of various fishing communities throughout the state.

Recently, ME DMR contracted with Market Decisions, Inc. to conduct a survey about the impacts of recent groundfish regulations in the state of Maine. In August 2002, Market Decisions released a Research Report entitled, *DMR Groundfish Regulation Impact Survey*, includes a substantial amount of important and helpful information to consider when analyzing the social and community impacts of future groundfish regulations. The impact survey is based on telephone interviews conducted during August 2002 with 168 vessel owners, shoreside business owners, and hired captains and crew in Maine's groundfish industry. Response rates were estimated to be no lower than 55.6%. In terms of sampling error, the percentages reported for the vessel owners are estimated to be within +/- 8% of all active groundfish permit holders in the state of Maine. The sampling error among shoreside business owners is estimated at +/- 8.8%. The data for the captains and crew is less comprehensive and should be considered in a qualitative sense, suggesting trends rather than absolute percentages.

The results from the Market Decisions survey provide useful descriptive fishery, social, and economic information, including: vessel and crew characteristics; port of landing; business practices; income; dependence on groundfish; impacts of recent groundfish regulations; priorities for assistance programs; and health insurance. Some of the key findings of this survey include:

- A large majority of vessel owners, captains, and crewmembers indicated that groundfish regulations have a negative impact on their businesses.
- Most often, vessel owners employ 1-2 people, and most shoreside owners employ more than 10 people in their business year-round.
- After May 1, 2002, only 30% of vessels were allocated more than 80 DAS.
- Under the new regulations, 75% of vessels lost more than 20 DAS.
- About 75% of shoreside business owners fully depend on the fishing industry.
- More than 75% of vessel owners invested in new gear to meet the 2002 regulations, and 7% invested in new groundfish permits.
- To finance their business, many vessel owners and shoreside business owners use alternative means of financing, including the use of family and personal savings, home equity loans, and personal credit cards.
- A majority of respondents are covered by health insurance – 69% of vessel owners, 79% of shoreside business owners, and 62% of hired captains and crew). A majority of spouses are also covered by health insurance.
- Just 5% of vessel owners provide health insurance for their employees; less than half of shoreside business owners provide health insurance to their employees.
- Forty percent of vessel owners indicted that they need at least 88 DAS to break even in their groundfish business.
- More than 1/3 of respondents had income from non-fishing activities (37% of vessel owners, 47% of shoreside business owners, and 33% of hired captains and crew). These activities cover a wide range of occupations.
- Twenty-seven percent of respondents receive income from just groundfishing (23% of vessel owners, 32% of shoreside business owners, and 38% of hired captains and crew).
- A majority of respondents thought that new groundfish regulations would make them get out of the industry or make their work more difficult.
- More than 1/3 of vessel or shoreside business owners are considering relocating their business, with most considering a move to Massachusetts.

Market decisions identified two prominent groups of respondents:

(1) a group consisting of smaller vessels with businesses that employ fewer people and have less business-related debt and investment. This group of individuals is more likely to have been allocated less than 88 DAS and fish less than 88 DAS. They are less likely to offer their employees health insurance and more likely to derive income from other marine and non-marine activities. This group represents about 20-30% of the survey respondents. The impacts on this group are likely to be more personal. The overall effect on this group will be to make a situation where many are doing whatever possible to hold onto their groundfish business even more difficult.

(2) a group consisting of larger vessels with businesses that employ more people and have larger business-related debt and investment. This group of individuals is more likely to have been allocated more than 88 DAS and actually fished more than 88 DAS (the percentage increases as the amount of debt and investment rises). They are more likely to offer their employees health insurance and less likely to derive income from other marine and non-marine activities. This group represents about 20-30% of respondents and more of the people who are directly involved in the groundfish fishery. They are investing in the business for better or worse and have significantly more business debt. The impact on this group will go beyond the direct financial impact on themselves and their family. It will lead to a reduction in household income, but it will also affect others in their business. It will also affect the larger business community, as it will become more difficult for them to pay off loans they have taken out on their business. They are more dependent on their groundfish business as their sole source of income, reducing the ability to use other sources of income to offset any losses. Much of this group is likely to relocate to other areas, potentially only shifting the problem to new ports or having to leave the industry due to factors such as the inability to pay off their debt and bankruptcy. This will have repercussions for other industries including shoreside businesses.

The state of Maine has established an informative website with information about the state's fisheries and fishing-related industries. A directory of fishing-related businesses can be accessed, as well as a species-specific database of related industries and products. The "news" and "links" on the website are also useful and informative. This information can be obtained at www.maineseafood.org.

Demographic Profile of Maine

MAINE	1990		2000		Percent change
Population (total individuals)	1,227,928		1,274,923		3.8%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	78.8%		85.4%		Difference = 6.6%
Poverty* (Number of families)	26,313		26,611		1.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	40,722	6.6%	31,165	4.8%	-23.5%

Table 551 - Population, education, poverty and unemployment statistics for the state of Maine (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Maine increased by 3.8% from 1990 to 2000 (Table 551). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 6.6% over the course of a decade. While the number of families below the poverty level increased slightly (1.1%), the unemployment rate declined, from 6.6% to 4.8% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino (of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
MAINE	1,274,923	1,262,276	1,236,014	6,760	7,098	9,111	382	2,911	12,647	9,360
COUNTY										
Androscoggin County	103,793	102,529	100,658	683	282	572	40	294	1,264	988
Aroostook County	73,938	73,350	71,572	281	1,005	351	19	122	588	441
Cumberland County	**265,612**	**262,598**	**254,291**	**2,815**	**763**	**3,707**	**99**	**923**	**3,014**	**2,526**
Franklin County	29,467	29,227	28,865	72	109	126	6	49	240	159
Hancock County	**51,791**	**51,196**	**50,554**	**130**	**193**	**196**	**18**	**105**	**595**	**336**
Kennebec County	117,114	115,922	114,129	404	469	690	24	206	1,192	852
Knox County	**39,618**	**39,310**	**38,935**	**94**	**87**	**141**	**4**	**49**	**308**	**225**
Lincoln County	**33,616**	**33,410**	**33,099**	**57**	**88**	**124**	**8**	**34**	**206**	**155**
Oxford County	54,755	54,315	53,797	95	151	201	12	59	440	292
Penobscot County	144,919	143,535	139,989	708	1,444	1,019	47	328	1,384	882
Piscataquis County	17,235	17,062	16,862	36	89	47	4	24	173	89
Sagadahoc County	**35,214**	**34,787**	**33,977**	**323**	**110**	**222**	**22**	**133**	**427**	**391**
Somerset County	50,888	50,434	49,868	121	208	171	11	55	454	234
Waldo County	**36,280**	**35,863**	**35,513**	**68**	**144**	**76**	**5**	**57**	**417**	**215**
Washington County	**33,941**	**33,577**	**31,728**	**88**	**1,505**	**101**	**4**	**151**	**364**	**274**
York County	**186,742**	**185,161**	**182,177**	**785**	**451**	**1,367**	**59**	**322**	**1,581**	**1,301**

Table 552 - Population by race in Maine counties, 2000
Counties examined in Fishing Communities section of AHE in bold type.
Data source: U.S. Census Bureau

The population of Maine is 96.9% white, with 1% of the individuals being of two or more races and just over 2% represented by all other races combined (Table 552). The population in Washington County (Downeast Maine) is 93.5% white, 4.4% American Indian and Alaska Native, 1.1% of two or more races, and under 1% black/African American, Asian, Hawaiian/Pacific Islander, other races, and Hispanic/Latino of any race. Washington has the highest percentage of non-whites of any of the Maine counties. Hancock, Waldo, and Knox counties, comprising Upper Mid-Coast Maine, are among the counties with the highest percentage of white individuals in the population, with whites composing 97.6%, 97.9% and 98.3% of their populations, respectively. Lincoln County has the highest percentage of whites of all counties in Maine, at 98.5%. Cumberland and Sagadahoc counties, which together with Lincoln compose the Lower Mid-Coast Maine group, are slightly more racially diverse. In Cumberland, 95.7% are white, 1.1% black/African American, 1.4% Asian, and 1.1% of two or more races. In Cumberland and Sagadahoc counties, 1% or more of the total populations are composed of Hispanic/Latino individuals of all races. York County, which is considered Southern Maine for the purposes of these analyses, has a population with a similar racial profile to those of Hancock and Waldo counties.

9.4.5.6.1 Downeast Maine

The downeast Maine port group is a secondary multispecies port group that includes Jonesport, West Jonesport, Beals Island, Milbridge, Machias, Eastport, and Dyers Bay. All of these ports are in Washington County.

MARFIN – The MARFIN Report provides profiles for several communities in the Downeast Maine group including Beals Island, Jonesport, and Eastport. It also includes a general profile of Washington County and the Downeast Maine sub-region. These profiles should be referenced for social and demographic data not contained in this document.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Ellsworth, Maine on December 7, 2000, and residents from several downeast communities attended and submitted comments. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of downeast communities relate to the loss of flexibility, long-term community impacts from the loss of fishing-related infrastructure, and a feeling of dislocation from the federal fisheries management process. The groundfish regulation that has produced the most significant social impacts for this community group may be a regulation that has not even been implemented yet. Those who commented at the social impact informational meeting are extremely concerned about the potential long-term social and community impacts of any action designed to reduce latent effort in the groundfish fishery. Please reference the complete meeting report for additional discussion of these and other important social impact issues.

Washington County	1990		2000		Percent change
Population (total individuals)	35,308		33,941		-3.9%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	73.2%		79.9%		Difference = 6.7%
Poverty* (Number of families)	1,444		1,319		-8.7%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	1,614	10.8%	1,312	8.5%	-18.7%

Table 553 - Population, education, poverty and unemployment statistics for Washington County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

While the total population of Maine increased from 1990 to 2000, the population in Washington County (Downeast Maine) declined 3.9% during this period (Table 553). The increase in Washington high school graduates or higher from 1990 to 2000 mirrored the state-wide increase. However, the total percentage of Washington County citizens 25+ years who graduated from high school or higher was lower than the state-wide percentage in both 1990 and 2000, with 85.4% of the total population in Maine and 79.9% of the total population in Washington County reaching this education level. The number of families below the poverty level decreased nearly 9% across the decade and unemployment fell 18.7%. Despite this decrease in unemployment, the unemployment level in Washington County remained high, at 10.8% of the civilian labor force unemployed in 1990 and 8.5% in 2000. Further loss of jobs and income related to Amendment 13 may have particularly strong effects in Downeast Maine.

Fishing Industry Employment in Downeast Maine

The number of individuals employed in fishing (harvesting fish) in Downeast Maine (Washington County) increased 14% from 1997 to 2000 (Table 554). The average annual payroll for nonemployers in the fishing sector (i.e., individual fishermen) in Washington County was about $33,529 in 2000. The fish and seafood wholesale sector had the greatest number of establishments after fishing in all years from 1998 to 2001. The number of establishments in this sector decreased nearly 22%, from 32 in 1998 to 25 in 2000, with an average annual payroll of $51,680 per establishment in 2000. Seafood product preparation and packaging establishments ranged from 8 to 10 during the time period. The number of establishments in fresh and frozen seafood processing and seafood canning remained relatively constant from 1998 to 2000, not exceeding five establishments in either of the sectors during a given year. There was only one fish and seafood market reported in Washington County during each year.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	1,179	1,264	1,308	1,344	NA
	Sum of Annual payroll ($1,000)	31,918	34,801	42,157	45,063	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	9	10	8	10
	Sum of Annual payroll ($1,000)	NA	4,135	E	E	3,049
311711** Seafood canning	Sum of Total Establishments	NA	4	5	3	4
	Sum of Annual payroll ($1,000)	NA	2,949	2,581	1,615	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	5	5	5	6
	Sum of Annual payroll ($1,000)	NA	1,186	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	32	32	29	25
	Sum of Annual payroll ($1,000)	NA	1,608	1,400	1,369	1,292
44522** Fish and seafood markets	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll ($1,000)	NA	D	D	D	D

Table 554 - Employment in fishing and related industries in Washington County, ME (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*

*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*

NAICS = North American Industry Classification System

***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*

***E** =reported as zero, may be in error or <$1,000*

***NA** = not applicable*

Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Downeast Maine

By Port of Landing

Table 555 summarizes landings and revenues by multispecies permit holders in Downeast Maine from the dealer weighout database. In Downeast Maine, there are many more non-multispecies permitted boats (e.g. state waters boats, lobster boats), so overall fishing activity in the area is much greater than these data suggest.

The number of permitted multispecies vessels landing fish in Downeast Maine remained relatively consistent from 1994 to 2001, with some decline towards the later years of the time period. Of these vessels, few were active in the groundfish fishery, this number declining across the time period from four in 1994 to one in 2001.

Total landings in Downeast Maine generally increased at an average annual rate of 10.3%. Total revenues increased at an even greater rate due to a dramatic increase in landings of high value species. From 1994 to 2001, the highest landings were generally composed of "other species," which *may* include monkfish, fluke, dogfish, skates, cusk or species not included in the categories described below (Table 555). Groundfish landings and revenues fluctuated from year to year, with an overall declining trend from 1994 to 2001. Groundfish were the second greatest component of the total landings throughout the time period, after Other Species.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Total Number of Active Multispecies Vessels	17	23	17	19	16	17	15	12
Number of Multispecies Vessels Landing Groundfish	4	5	3	0	2	1	0	1
TOTAL								
Landings	284.9	466.0	314.5	327.5	442.0	436.4	551.1	423.5
Revenues	$500.1	$1,072.5	$780.7	$831.6	$872.6	$1,097.9	$1,474.6	$1,200.3
GROUNDFISH								
Landings	205.6	223.2	92.3	0.0	*C*	*C*	0.0	*C*
Revenues	$179.1	$217.2	$77.3	$0.0	*C*	*C*	$0.0	*C*
SMALL MESH MULTISPECIES								
Landings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Revenues	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Revenues	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
OTHER SPECIES								
Landings	74.5	229.6	213.4	318.4	340.5	423.9	549.2	395.0
Revenues	$290.4	$765.2	$641.3	$765.6	$794.9	$1,025.9	$1,461.6	$1,177.8
HIGH VALUE SPECIES								
Landings	4.8	13.2	8.9	9.1	C	10.0	C	0.0
Revenues	$28.8	$86.0	$61.3	$65.7	C	$69.4	C	$0.0

Table 555 - Landings and Revenues from Multispecies Permit Holders in Downeast Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

Table 556 summarizes fishing activity by vessels homeported in Downeast Maine. The number of permitted multispecies vessels homeported in Downeast Maine and reporting groundfish landings is low compared to the number of permitted multispecies vessels landing *any* species or the total number of vessels with multispecies permits.

Total landings by vessels homeported in Downeast Maine fluctuated from 1994 to 2001, with an overall increasing trend. The greatest change occurred from 1994 and 1995, when landings more than doubled. Total revenues exhibit a similar trend. Groundfish landings and revenues also fluctuated from 1994 to 2001, with a generally increasing trend across the time period. The greatest declines in groundfish landings occurred from 1998 to 2000, when the number of permitted multispecies vessels landing groundfish and homeported in Downeast Maine decreased. Groundfish dependence in Downeast Maine declined from 45.2% to near-zero in 2000, with a slight increase to 5.3% in 2001. The number of permitted multispecies vessels landing groundfish decreased from 1994 to 2001, while the total number of active permitted multispecies vessels (landing any species) remained relatively stable across the time period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	24	29	37	32	34	43	47	52
TOTAL								
Number Active*	11	15	14	15	14	17	13	19
Landings	341.3	720.6	528.9	700.9	580.0	410.6	546.3	544.1
Revenues	$540.7	$1,262.6	$1,023.5	$1,189.2	$978.2	$983.4	$1,543.5	$1,482.1
GROUNDFISH								
Number Active**	4	6	4	2	4	2	1	3
Landings	271.8	350.8	137.4	*C*	231.4	*C*	*C*	94.2
Revenues	$244.2	$349.3	$119.4	*C*	$187.2	*C*	*C*	$78.9
Multispecies Revenues as a percent of Total Revenues	45.2%	27.7%	11.7%	~14%	19.1%	~1%	~0%	5.3%

Table 556 - Fishing Activity for Vessels Homeported in Downeast Maine
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.6.2 Upper Mid-Coast Maine

The port groups in Upper Mid-Coast Maine fall within three counties – Hancock, Waldo and Knox counties. The following is a description of the population, education, poverty, unemployment and fishing industry participation in these counties.

Hancock County	1990		2000		Percent change
Population (total individuals)	46,948		51,791		10.3%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	83.3%		87.8%		Difference = 4.5%
Poverty* (Number of families)	855		997		16.6%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	1,369	6.1%	1,416	5.4%	3.4%

Table 557 - Population, education, poverty and unemployment statistics for Hancock County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Hancock County includes the ports of Stonington and Sunshine/Deer Isle (Upper Mid-Coast 2), and Winter Harbor, Southwest Harbor, Bar Harbor, Northeast Harbor, and Northwest Harbor (Upper Mid-Coast 3). The total population in Hancock County increased more than 10% between 1990 and 2000 (Table 557). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 83.3% in 1990 to 87.8% in 2000, a rise of 4.5 percentage points over the period. The number of families living in poverty increased 16.6%. Unemployment remained low relative to Washington County but increased 3.4% over the decade.

Waldo County	1990		2000		Percent change
Population (total individuals)	33,018		37,252		12.8%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	77.4%		84.6%		Difference = 7.2%
Poverty* (Number of families)	1,144		1,100		-3.8%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	1,504	9.6%	1,040	5.7%	-30.9%

Table 558 - Population, education, poverty and unemployment statistics for Waldo County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

While the total population in Waldo County is smaller than that in Hancock County, it expanded at a greater rate from 1990 to 2000, with a 12.8% increase (Table 558). The percent of the population 25 years and over graduating from high school and above increased from 77.4% to 84.6%, but remained below the educational attainment level in Hancock County. Number of families in poverty decreased 3.8% and unemployment decreased substantially, from 9.6% of the civilian labor force in 1990 to 5.7% in 2000.

Knox County	1990		2000		Percent change
Population (total individuals)	36,310		39,618		9.1%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	80.8%		87.5%		Difference = 6.7%
Poverty* (Number of families)	806		695		-13.8%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	1,258	7.2%	676	3.4%	-46.3%

Table 559 - Population, education, poverty and unemployment statistics for Knox County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Knox County includes the ports of Rockland, Port Clyde, Sprucehead, Owls Head, Friendship, Friendship Harbor, Camden and Vinalhaven (Upper Mid-Coast 1). In Knox County, a county with a similar population size as Waldo County, population increased about 9%, from 36,310 to 39,618 between 1990 and 2000 (Table 559). Educational attainment (high school or higher) increased about 6.7 percentage points over the decade. Relative to Waldo County, Knox has a low poverty rate and the number of families in poverty decreased nearly 14% from 1990 to 2000. The number of unemployed also decreased more than 46% to a low level of 676, or 3.4% of the civilian labor force, in 2000. Based on these data, it appears that Knox County has experienced economic and social growth since 1990.

Fishing Industry Employment in Upper Mid-Coast Maine

Hancock County
The number of individuals employed in fishing (1141) remained relatively consistent from 1997 to 2000, averaging 1,244 during that period (Table 560). The average annual payroll for individuals in the fishing sector was $44,524 in 2000. Of the remaining fishing-related industry sectors, the fish and seafood wholesale sector comprised the greatest number of establishments, with an average of 37 establishments from 1998 to 2000, and a decrease to 33 in 2001. Seafood product preparation and packaging and seafood canning remained stable but small sectors, with 3-5 establishments each in every year from 1998 to 2001. One establishment was reported in the fresh and frozen seafood processing sector in 1998-2000, increasing to 2 in 2001. No fish and seafood markets were reported in Hancock County in 1998 and 1999, and only 1 in 2000 and 2001. In general, the fishing industry has remained an active, stable presence in Hancock County since the late 1990s.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	1,228	1,264	1,250	1,232	NA
	Sum of Annual payroll ($1,000)	43,334	45,072	54,523	54,853	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	4	5	5	5
	Sum of Annual payroll ($1,000)	NA	2,682	2,657	E	3,649
311711** Seafood canning	Sum of Total Establishments	NA	3	4	4	3
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	1	1	2
	Sum of Annual payroll ($1,000)	NA	D	D	D	D
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	37	36	37	33
	Sum of Annual payroll ($1,000)	NA	4,334	4,918	4,902	5,013
44522** Fish and seafood markets	Sum of Total Establishments	NA	0	0	1	1
	Sum of Annual payroll ($1,000)	NA	0	0	D	D

Table 560 - Employment in fishing and related industries in Hancock County, ME (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Waldo County

The number of reported establishments in the fishing sector is much lower in Waldo County than in Hancock or Knox counties, increasing from 129 in 1997 to 146 in 2000 (Table 561). The average annual payroll for an individual in the fishing sector was $37,760 in 2000, lower than the average in Hancock County. The number of fish and seafood wholesale establishments declined 50%, from 8 in 1998 to 4 in 2001. Other seafood and fishing related sectors have a very limited presence in Waldo County, although participation in seafood product preparation and packaging and fish and seafood markets increased slightly or remained stable between 1999 and 2001. Overall, the fishing industry in Waldo County is small, with the harvesting sector increasing slightly, fish and seafood wholesale declining, and other sectors remaining relatively stable.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	129	144	139	146	NA
	Sum of Annual payroll ($1,000)	2,661	3,445	4,578	5,513	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	2	2	2
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	1	2	2	1
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	0	0	0	1
	Sum of Annual payroll ($1,000)	NA	0	0	0	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	8	8	7	4
	Sum of Annual payroll ($1,000)	NA	3,437	1,897	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	0	0	1	1
	Sum of Annual payroll ($1,000)	NA	0	0	E	E

Table 561 - Employment in fishing and related industries in Waldo County, ME (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Knox County

The number of individuals employed in the fishing sector in Knox is similar to that in Hancock, increasing steadily (an annual average of about 1%) from 1,252 in 1997 to 1,293 in 2000 (Table 562). However, the average annual payroll for fishers in Knox County greatly exceeds that of Hancock and Waldo counties, at $61,061 in 2000. The primary target stocks for the port group Upper Mid-Coast 1 (Knox County) are small-mesh non-multispecies, these being primarily herring, while multispecies permit holders in Upper Mid-Coast 2 and 3 (Hancock County) have a greater dependence on groundfish as a percentage of their total revenues from fishing. The fish and seafood wholesale sector, which has a greater number of establishments than other fishing-related sectors (besides the harvesting sector) in Knox County, decreased in size, declining 17% 1998 to 2001. No seafood canning establishments were reported in Knox County. The number of establishments reported in each year for the seafood product preparation and packaging, fresh and frozen seafood processing, fish and seafood markets sectors ranged from 2 to 3 from 1998 to 2001.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	1,252	1,269	1,277	1,293	NA
	Sum of Annual payroll	62,138	62,485	76,734	78,952	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	3	2	3	2
	Sum of Annual payroll	NA	502	E	636	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	3	2	3	2
	Sum of Annual payroll	NA	502	E	636	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	41	38	36	34
	Sum of Annual payroll	NA	6,296	6,320	6,702	6,413
44522** Fish and seafood markets	Sum of Total Establishments	NA	2	2	2	3
	Sum of Annual payroll	NA	E	E	E	159

Table 562 - Employment in fishing and related industries in Knox County, ME (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.6.2.1 Upper Mid-Coast 1, Maine

The Upper Mid-Coast 1, Maine group is a secondary multispecies port group that includes Rockland, Port Clyde, Sprucehead, Owls Head, Friendship, Friendship Harbor, Camden, and Vinalhaven. All of these communities are in Knox County.

MARFIN – The MARFIN Report provides detailed profiles for several communities in the Upper Mid-Coast 1 group including Rockland and Vinalhaven. The Report also includes a general profile of the Upper Mid-Coast Maine sub-region, Waldo County, Knox County, and Hancock County, the counties in which the communities in the Upper Mid-Coast groups are located. These profiles should be referenced for social and demographic data not contained in this document.

Upper Mid-Coast 1, Maine is not a primary port group for groundfish activity, but is one of the areas of particular interest in this document, primarily because concerns about and impacts on this community group are likely to be reflective of many communities throughout Maine. Knox county is the smallest county in Maine, but has the largest commercial fishing industry. Rockland was first known as “shore village” until it was incorporated as Rockland in 1854. The MARFIN report describes that in the late 1800s, Rockland was a leading port for the export of lime rock.

Rockland used to be an important groundfish and harvesting port, with two offshore fleets that fished in Canadian waters. After the Hague Line was established in 1984 and US fishermen were excluded from Canadian fishing grounds, these offshore fleets eventually disappeared. According to the MARFIN Report, Rockland used to be renowned for redfish, before the stock collapsed. Today, herring and lobster are the primary fisheries in Rockland. MARFIN found that there are about 30 lobster boats in Rockland, 5 purse seiners fish for herring, and a few groundfish trawl and gillnet vessels. MARFIN reported that some individuals with larger boats and groundfish permits have developed innovative ways to use different gear at sea to harvest groundfish, scallops and shrimp. Some former groundfish fishermen have switched to lobstering when possible.

The 1990 Census determined that 7,972 people lived in Rockland, and only 63 were non-white. Estimates varied greatly in the MARFIN Report related to the number of fishermen in the Rockland area (40 to 250). Employment that is indirectly dependent on fishing such as trucking and bait supply is high. Rockland has lost several processing plants over the years, and now the city is principally a depot for the transport of fish and lobster to other places. Although there are numerous outlets for employment in the area, the MARFIN Report considers Rockland an essential provider to the fishing industry due to it's role as a major transporter of herring as lobster bait and transshipment of lobsters. Fishing is considered to be very important in Rockland, and lobster landings are the highest in the state. MARFIN cited that there are numerous fishery-related groups in the area. For example, the Maine Sea Grant Cooperative Extension at the University of Maine is active with outreach programs and industry members in the area. Rockland is not considered to be a popular recreational fishing center, mostly because the fishing grounds are relatively far from shore.

Vinalhaven is the other major port in the Upper Mid Coast 1 region of Maine. Vinalhaven is an island community 15 miles off the coast. The MARFIN Report found that seafood has always played a major role in the economy of this island, and in the days of tub trawling and dragging, Vinalhaven was a major groundfish port. Effort from foreign factory trawlers in the 1960s was blamed for the demise of the Vinalhaven groundfish fleet in the MARFIN Report. Currently, there is no groundfish activity in Vinalhaven. Today, 8-10 % of all lobsters landed in Maine are from Vinalhaven, and many of them are being frozen for shipment around the US and worldwide. In addition to lobsters, some rock crab, sea scallops, and herring are also landed here.

Recent interviews in the MARFIN Report suggest that there are about 1,200 residents in Vinalhaven, and as many as 2,400 visitors in the summer. Two-thirds of the population is employed as lobstermen, and the rest are involved in tourism. MARFIN reported that fishing is the center of life in Vinalhaven. It is estimated that two-thirds of the residents are members of fishing families. There are about 300 relatively small lobster vessels, a few urchin divers, and two purse seiners. In 1997, 58 vessels homeported in Vinalhaven held federal permits. There is little extra room for recreational vessels in Carver Harbor in Vinalhaven, so recreational fishing effort is non-existent.

Social Impact Informational Meetings – Council staff conducted social impact informational meetings in Ellsworth, Maine on December 7, 2000 and Portland, Maine on November 13, 2000. A few residents from communities in Upper Mid-Coast 1 attended these meetings and submitted comments. The summary from these meetings can be found in Appendix I.

Fishing Activity in Upper Mid-Coast 1, Maine

By Port of Landing

The total number of active permitted multispecies vessels landing fish in Upper Mid-Coast 1 ranged from 26 to 30 in each year from 1994 to 1999, increasing in 2000 and 2001 (Table 563). Approximately half of these permitted vessels reported landings of regulated multispecies between 1994 and 2001, the number of multispecies vessels landing groundfish increasing about 67% from 1994 to 2001. Landings in all species categories generally increased from 1994 to 2001. Total landings rose from 1,745,000 pounds in 1994 to a peak of 42,739,000 pounds in 1997, declined 40.8% from 1997 to 1998, and remained relatively stable until 2001. Groundfish landings, which typically made up the second greatest component of total landings across the time period, increased or remained steady across the time period. Small mesh non-multispecies, which generally comprised the greatest percentage of the total landings across the time period, increased dramatically from 862,400 pounds in 1994 to 41.5 million pounds in 1997. Small mesh non-multispecies landings, most likely dominated by herring, declined about 42% from 1997 to 1998 and remained fairly steady 1998 through 2001. Landings of other species generally increased across the time period, with 2001 landings 2.3 times greater than 1994 landings. High value species landings increased from 1994 to 1995 but generally declined from 1995 through 1999, with a slight increase in 2000 and 2001. Small mesh multispecies were the smallest component of total landings in Upper Mid-Coast 1 throughout this period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Total Number of Active Multispecies Vessels	26	30	30	25	27	28	43	38
Number of Multispecies Vessels Landing Groundfish	12	13	15	16	19	21	26	20
TOTAL								
Landings	1,745.0	1,766.5	3,383.8	42,738.8	25,292.2	29,869.5	20,348.9	25,996.3
Revenues	$1,970.9	$2,299.1	$2,455.5	$4,580.5	$3,760.2	$3,969.5	$3,610.6	$3,577.2
GROUNDFISH								
Landings	598.4	643.1	712.1	925.9	1,006.2	998.9	1,201.6	1,418.8
Revenues	$732.8	$820.3	$726.3	$1,030.8	$1,136.1	$1,086.9	$1,139.7	$1,212.0
SMALL MESH MULTISPECIES								
Landings	0.0	0.2	0.5	0.2	0.2	0.5	1.1	0.8
Revenues	$0.0	$0.1	$0.1	$0.0	$0.1	$0.2	$0.2	$0.3
SMALL MESH NON-MULTISPECIES								
Landings	862.4	846.2	2,449.8	41,545.5	23,966.3	28,468.4	18,658.6	23,957.2
Revenues	$783.7	$610.1	$1,348.5	$3,125.3	$2,074.1	$2,114.9	$1,338.0	$1,559.3
OTHER SPECIES								
Landings	264.2	221.4	199.2	254.1	303.5	397.2	476.2	612.3
Revenues	$281.9	$244.0	$227.8	$330.7	$435.4	$735.4	$1,058.5	$771.6
HIGH VALUE SPECIES								
Landings	19.9	55.5	22.2	13.1	16.0	4.5	11.5	7.2
Revenues	$172.5	$624.6	$152.8	$93.7	$114.6	$32.0	$74.1	$34.0

Table 563 - Landings and Revenues from Multispecies Permit Holders in Upper Mid-Coast 1, Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The total number of permitted multispecies vessels homeported in Upper Mid-Coast 1 peaked at 88 vessels in 1996, decreasing by about 50% in the following year as a result of the Amendment 7 capacity reduction efforts (Table 564). From 1997 to 2001, the number of multispecies permits in Upper Mid-Coast 1, Maine, increased 42%, from 45 to 64. The number of multispecies vessels landing any species increased as a percentage of total permitted vessels, from 38% of the total number in 1994 to 53% in 2001. The number of active vessels declined from 1996 to 1997, remained stable throughout the next three years, and increased in 2001. The landings by these vessels increased an annual average of 53.8%, while total revenues increased only 5.2% due to a decrease in landings of high value species.

The number of permitted multispecies vessels in Upper Mid-Coast 1 reporting landings of groundfish remained consistent from 1994 to 2000, averaging about 17 vessels in each year. Twenty-three Upper Mid-Coast 1 vessels landed groundfish in 2001. Groundfish landings and revenues increased from 1994 to 1995, declined 51.6% from 1995 to 1996, and generally increased after 1996 to a peak of 2,231,800 pounds in 2001. Dependence on groundfish as a component of total fishing revenues by multispecies permit holders in Upper Mid-Coast 1 averaged 33.7% across the time period, dropping from around 50% in 1995 to 23% in 1996, and increasing to 36.6% in 2001. The decline in dependence in 1996 coincides with the lowest groundfish landings of the time period reported during that year and an increase in reported landings of small mesh non-multispecies (herring).

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	79	86	88	45	48	49	55	64
TOTAL								
Number Active*	30	36	35	20	22	22	24	34
Landings	3,102.9	6,945.7	14,295.5	33,922.3	19,187.0	29,371.2	28,366.1	29,296.0
Revenues	$3,900.3	$4,135.8	$3,975.8	$5,059.9	$4,110.2	$4,129.1	$4,602.1	$5,222.0
GROUNDFISH								
Number Active**	17	17	18	15	16	16	17	23
Landings	1,624.6	1,777.3	860.9	1,169.5	1,036.9	1,092.3	1,381.6	2,231.8
Revenues	$1,893.2	$2,085.3	$916.1	$1,272.2	$1,151.6	$1,191.5	$1,349.0	$1,913.7
Multispecies Revenues as a percent of Total Revenues	48.5%	50.4%	23.0%	25.1%	28.0%	28.9%	29.3%	36.6%

Table 564 - Fishing Activity for Vessels Homeported in Upper Mid-Coast 1, Maine
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.6.2.2 Upper Mid-Coast 2, Maine

The Upper Mid-Coast 2, Maine group is a secondary multispecies port group that includes Stonington and Sunshine/Deer Isle. These communities are in Hancock County.

MARFIN – The MARFIN Report provides a detailed profile for Stonington and Deer Isle. It also includes a general profile of the Upper Mid-Coast Maine sub-region and Hancock County, the county in which Stonington and Deer Isle are located. These profiles should be referenced for social and demographic data not contained in this document.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Ellsworth, Maine on December 7, 2000, and residents from Stonington and Deer Isle attended and submitted comments. The summary from this meeting can be found in Appendix I.

Additional Community Information – In 1999, the Stonington Fisheries Alliance produced an inventory of the fishing industry in Stonington and Deer Isle, which includes quite a bit of interesting information. The inventory includes a narrative that describes changes that have occurred in the Stonington/Deer Isle fishing industry over throughout the last decade, an overview of the history of Deer Isle as it relates to the importance of the fishing industry in the last century, and detailed data on the various fisheries, support services, and ancillary businesses in the area. According to the inventory, over 50% of the resident population of Stonington and Deer Isle (total population estimated to be 3,134) is involved in some aspect of the fishing industry.

Fishing Activity in Upper Mid-Coast 2, Maine

By Port of Landing

Fewer multispecies vessels landed fish in Upper Mid-Coast 2 than Upper Mid-Coast 1, the number declining from 1994 to 2001 (Table 565). In 1994, 10 out of 12 active multispecies vessels landed groundfish; by 2000 the number of multispecies vessels landings groundfish had fallen to 3, out of a total of 6 active vessels. After a general decline from 1994 to 1999, total landings increased dramatically from 101,600 pounds in 1999 to 12,270,800 pounds in 2001. Total revenues increased in the later years of the period as well, but not as dramatically. Groundfish landings fluctuated, with an average annual decline of 2.1%. Groundfish made up the majority of total landings in all years except 2000 and 2001, when small mesh non-multispecies landings increased dramatically, contributing to over 95% of the total landings in those years.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	12	18	15	8	10	5	6	9
Number of Multispecies Vessels Landing Groundfish	10	10	6	5	6	3	3	5
TOTAL								
Landings	587.5	438.7	653.7	331.4	381.0	101.6	6,729.7	12,270.8
Revenues	$593.7	$442.5	$822.1	$421.9	$435.8	$124.3	$550.3	$845.3
GROUNDFISH								
Landings	534.7	231.4	520.3	295.3	318.3	82.4	79.2	103.6
Revenues	$546.3	$241.3	$399.6	$201.8	$271.0	$93.0	$94.6	$106.7
SMALL MESH MULTISPECIES								
Landings	0.9	C	C	0.0	C	C	C	0.0
Revenues	$0.5	C	C	$0.0	C	C	C	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	20.5	C	C	5.9	41.5	13.7	C	12,157.0
Revenues	$6.0	C	C	$5.4	$44.0	$12.8	C	$711.4
OTHER SPECIES								
Landings	30.4	192.1	40.7	3.5	5.9	3.6	4.9	7.6
Revenues	$33.8	$48.5	$19.5	$4.4	$7.5	$6.3	$10.8	$8.2
HIGH VALUE SPECIES								
Landings	1.1	13.4	64.7	26.7	15.3	C	C	2.5
Revenues	$7.2	$151.7	$380.2	$210.3	$113.2	C	C	$19.1

Table 565 - Landings and Revenues from Multispecies Permit Holders in Upper Mid-Coast 2, Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport
Total number of permitted multispecies vessels with homeports in Upper Mid-Coast 2, Maine, declined from 1996 to 1997, remained relatively steady at 15-17 vessels until an increase to over 20 in 2000 (Table 566). Of these, approximately half reported landings of any species. Vessels reporting landings of groundfish declined from 10 in 1994 to just 4 in 2001. Total landings by vessels homeported in Upper Mid-Coast 2 declined 27.6% on average each year. Groundfish landings fluctuated in the beginning of the time period and generally decreased from 1996 to 2001. Groundfish contributed to just under half of the total revenues from 1994 to 1997, increasing steadily to 82.2% of the total in 2000. Multispecies revenues as a percent of total revenues fell to a period low of 33.6% in 2001, a year in which other species and high value species experienced increases in landings.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	23	25	31	17	15	17	21	24
TOTAL								
Number Active*	11	10	11	8	7	6	4	10
Landings	4,615.7	2,505.9	811.8	510.8	409.9	141.8	184.9	206.8
Revenues	$1,014.4	$537.0	$894.9	$579.5	$463.5	$170.4	$217.4	$303.0
GROUNDFISH								
Number Active**	10	6	5	5	6	4	3	4
Landings	449.1	210.4	519.6	387.6	339.6	115.5	168.6	99.4
Revenues	$463.8	$218.7	$398.9	$263.7	$284.5	$133.9	$178.6	$101.9
Multispecies Revenues as a percent of Total Revenues	45.7%	40.7%	44.6%	45.5%	61.4%	78.6%	82.2%	33.6%

Table 566 - Fishing Activity for Vessels Homeported in Upper Mid-Coast 2, Maine
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.6.2.3 Upper Mid-Coast 3, Maine

The Upper Mid-Coast 3, Maine group is a secondary multispecies port group that includes Winter Harbor, Southwest Harbor, Bar Harbor, Northeast Harbor, and Northwest Harbor. These communities are located in Hancock County.

MARFIN – The MARFIN Report provides general profiles for the Upper Mid-Coast sub-region and Hancock County, the county in which the communities in this group are located. These profiles should be referenced for social and demographic data not contained in this document.

Fishing Activity in Upper Mid-Coast 3, Maine

By Port of Landing
The number of active multispecies vessels landing fish in Upper Mid-Coast 3 ranged from 21 to 28 between 1994 and 2001, with a peak of 44 vessels in 1996 (Table 567). Total landings decreased from 1994 to 1998, nearly doubled in the following year, and continued to increase through 2001. Total revenue trends were driven by landings of high value species – in some years where total landings increased, total revenues decreased because of declines in landings of high value species. The number of multispecies vessels landing groundfish generally decreased, with some fluctuation between 1994 and 2001. Groundfish landings declined six-fold from 1994 to 1998, then tripled from 1998 to 2001. Groundfish made up the greatest

fraction of total landings, followed by high value and other species, small mesh non-multispecies, and small mesh multispecies.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	21	28	44	24	25	21	22	25
Number of Multispecies Vessels Landing Groundfish	15	10	11	6	11	7	4	7
TOTAL								
Landings	638.2	483.3	344.6	262.1	146.0	285.2	302.7	386.3
Revenues	$894.1	$561.9	$621.6	$851.6	$475.3	$1,135.2	$922.8	$623.1
GROUNDFISH								
Landings	451.5	198.6	189.8	143.7	74.3	100.5	138.7	247.3
Revenues	$457.7	$208.8	$155.1	$115.9	$76.9	$119.9	$135.3	$212.2
SMALL MESH MULTISPECIES								
Landings	0.0	C	0.0	0.0	0.0	0.0	0.0	0.0
Revenues	$0.0	C	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	54.1	C	26.9	0.0	5.9	C	22.5	9.5
Revenues	$49.2	C	$23.3	$0.0	$6.6	C	$20.4	$11.8
OTHER SPECIES								
Landings	99.9	249.6	70.6	20.0	13.8	16.0	17.8	35.3
Revenues	$166.0	$75.7	$38.1	$31.3	$22.9	$28.2	$41.6	$45.3
HIGH VALUE SPECIES								
Landings	32.7	32.1	57.3	98.3	52.0	164.6	123.7	94.2
Revenues	$221.2	$275.1	$405.1	$704.4	$368.9	$983.4	$725.5	$353.8

Table 567 - Landings and Revenues from Multispecies Permit Holders in Upper Mid-Coast 3, Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels with home ports in Upper Mid-Coast 3, Maine, decreased from 40 to 23 between 1996 and 1997 but remained stable throughout the remainder of the period (Table 568). The number of multispecies vessels landing any species peaked at 20 (50% of the total number of permitted multispecies vessels) in 1996, and ranged from 10 to 13 during the following years. Total landings increased from 1994 to 1998, dropping by over 100% in the following year, and fluctuating during 2000 and 2001. Total revenues declined consistently from 1994 to 2001 due to a drop in landings of high value species. The number of permitted multispecies vessels landing groundfish averaged 11 from 1994 to 1998, decreasing to 5 in 2001. Groundfish landings remained relatively stable, with a slight overall average decline. The relative importance of groundfish revenues to Upper Mid-Coast 3 fishermen declined in the early years, from 42.6% of total revenues in 1994 to 22.2% in 1996, fluctuating around an average of 32% from 1997 to 2000, and increasing to a peak of 47% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	35	40	40	23	25	23	24	25
TOTAL								
Number Active*	13	19	20	11	13	12	10	10
Landings	1,287.6	1,203.4	1,428.4	2,741.9	6,511.2	578.1	1,714.6	559.2
Revenues	$1,548.3	$1,378.5	$1,267.3	$1,287.2	$1,216.2	$1,316.5	$848.2	$743.3
GROUNDFISH								
Number Active**	11	10	13	10	10	8	5	5
Landings	599.8	317.3	314.2	364.6	423.6	259.9	298.4	387.4
Revenues	$660.0	$359.2	$281.1	$336.5	$475.8	$322.7	$322.6	$349.2
Multispecies Revenues as a percent of Total Revenues	42.6%	26.1%	22.2%	26.1%	39.1%	24.5%	38.0%	47.0%

Table 568 - Fishing Activity for Vessels Homeported in Upper Mid-Coast 3, Maine
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.6.3 Lower Mid-Coast Maine

The port groups in Lower Mid-Coast Maine fall within three counties – Lincoln, Sagadahoc, and Cumberland counties. The following is a description of the population, education, poverty, unemployment and fishing industry participation in these counties.

Lincoln County	1990		2000		Percent change
Population (total individuals)	30,357		33,616		10.7%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	81.4%		87.9%		Difference = 6.5%
Poverty* (Number of families)	542		636		17.3%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	923	6.3%	721	4.3%	-21.9%

Table 569 - Population, education, poverty and unemployment statistics for Lincoln County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Lincoln County includes the ports of New Harbor, Bristol, South Bristol, Boothbay Harbor, East Boothbay, Medomak, Southport, and Westport (Lower Mid-Coast 1). The total population in Lincoln County increased nearly 11% between 1990 and 2000 (Table 569). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 81.4% in 1990 to 87.9% in

2000, a rise of 6.5 percentage points over the period. The number of families living in poverty increased 17.3%. Unemployment declined from 6.3% of the labor force in 1990 to 4.3% in 2001.

Sagadahoc County	1990		2000		Percent change
Population (total individuals)	33,535		35,214		5.0%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	81.1%		88.0%		Difference = 6.9%
Poverty* (Number of families)	541		673		24.4%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	842	5.1%	604	3.3%	-28.3%

Table 570 - Population, education, poverty and unemployment statistics for Sagadahoc County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Sagadahoc County includes the ports of Sebasco Estates, Small Point, West Point, Five Islands, and Phippsburg (Lower Mid-Coast 3). Total population is similar in size to Lincoln County but demonstrated a smaller increase (5%) from 1990 to 2000 (Table 570). Educational attainment increased from 81.1% in 1990 to 88% in 2000. The number of families living in poverty increased more than 24% over the decade, while the number of unemployed declined 28.3% and the unemployment dropped to a very low rate of 3.3% in 2000.

Cumberland County	1990		2000		Percent change
Population (total individuals)	243,135		265,612		9.2%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	85.0%		90.1%		Difference = 5.1%
Poverty* (Number of families)	3,601		3,527		-2.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	6,786	5.2%	5,296	3.7%	-22.0%

Table 571 - Population, education, poverty and unemployment statistics for Cumberland County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Cumberland County includes the ports of Portland (Primary Multispecies Port in Lower Mid-Coast Maine) and Cundys Harbor, Orrs Island, Yarmouth, Harpswell, East Harpswell, South Harpswell, Bailey Island, and Cape Elizabeth (Lower Mid-Coast 2). Total population in Cumberland County is approximately seven times greater than that in Lincoln and Sagadahoc counties and also demonstrated an increase from 1990 to 2000 (Table 571). The percent of individuals 25+ years who graduated from high school or higher increased five percentage points from 1990 to 2000, reaching 90.1%. Number of families in poverty and unemployment both declined in Cumberland. Cumberland County experienced economic improvement and educational growth in the decade from 1990 to 2000.

Fishing Industry Employment in Upper Mid-Coast Maine

Lincoln County

The number of individuals employed in fishing (1141) declined slightly from 1997 to 2000, averaging 925 during that period (Table 572). The average annual payroll for individuals in the fishing sector was $36,322 in 2000. The fish and seafood wholesale sector comprised the greatest number of establishments after the fishing sector, with an average of 24 establishments from 1998 to 2001. No establishments were reported in the seafood canning sector. Seafood product preparation and packaging, fresh and frozen seafood processing, and fish and seafood markets sectors remained small but stable. These data demonstrate that the fishing industry has remained an active, stable presence in Lincoln County since the late 1990s.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	929	938	925	908	NA
	Sum of Annual payroll ($1,000)	31,853	31,059	34,709	32,980	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	2	2	1
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	2	2	2	1
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	26	23	24	24
	Sum of Annual payroll ($1,000)	NA	2,633	2,930	3,469	3,479
44522** Fish and seafood markets	Sum of Total Establishments	NA	4	5	5	5
	Sum of Annual payroll ($1,000)	NA	250	265	E	E

Table 572 - Employment in fishing and related industries in Lincoln County, ME (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Sagadahoc County

The number of fishing establishments in Sagadahoc County averaged 292 from 1997 to 2000, decreasing slightly over the time period (Table 573). The average payroll for fishers in Sagadahoc was $33,552 in 2000. All other fishing-related sectors reported between 1 and 4 establishments in each year from 1998 to 2001. These sectors remained stable across the time period, fluctuating very little in the number of establishments reported each year.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	299	309	290	268	NA
	Sum of Annual payroll ($1,000)	8,422	7,309	8,391	8,992	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	3	3	3	2
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	2	2	2	1
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	3	3	3	3
	Sum of Annual payroll ($1,000)	NA	E	E	E	182
44522** Fish and seafood markets	Sum of Total Establishments	NA	2	3	1	4
	Sum of Annual payroll ($1,000)	NA	E	E	E	E

Table 573 - Employment in fishing and related industries in Sagadahoc County, ME (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Cumberland County

The number of fishers in Cumberland County exceeded that in Lincoln and Sagadahoc due to Portland's participation in the fishing industry in this county (Table 574). Portland is regarded as a "primary multispecies port" in Maine because of the high level of activity in the fishing industry there. The average payroll for fishers in Cumberland County was $53,847 in 2000, exceeding the average in Sagadahoc and Lincoln counties. The number of fish and seafood wholesale establishments declined from 39 in 1998 to 35 in 2001, while the number of fish and seafood markets increased from 11 to 14 over the time period. Seafood product preparation and packaging and fresh and frozen seafood processing averaged about 12 establishments in each year from 1998 to 2001. Two seafood canning establishments were reported in each year from 1999 and 2001.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	1,018	995	955	987	NA
	Sum of Annual payroll ($1,000)	40,708	37,784	45,353	53,147	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	10	14	12	12
	Sum of Annual payroll ($1,000)	NA	890	1,257	1,468	E
311711** Seafood canning	Sum of Total Establishments	NA	1	2	2	2
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	9	12	10	10
	Sum of Annual payroll ($1,000)	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	39	38	33	35
	Sum of Annual payroll ($1,000)	NA	12,257	12,740	12,804	12,263
44522** Fish and seafood markets	Sum of Total Establishments	NA	11	12	14	14
	Sum of Annual payroll ($1,000)	NA	1,275	1,498	2,110	1,858

Table 574 - Employment in fishing and related industries in Cumberland County, ME (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.6.3.1 Portland, Maine

Portland, Maine has been identified as a primary multispecies port. Portland is the only primary multispecies port in the state of Maine. Information obtained from industry members in Portland and throughout the state suggests that the majority of Maine's groundfish fishery has concentrated in Portland since the implementation of Amendments 5 and 7. As previously discussed, this concentration has occurred primarily for economic reasons. The emergence of the Portland Fish Exchange in 1986 and its evolution since that time have allowed Portland to become a marketing center for groundfish and other seafood products. In addition, increased regulations in groundfish and other fisheries have led to an industry downsizing in many smaller communities. Ice facilities, cutting houses, vessel repair services, and other related industries have gone out of business in smaller communities, leaving Portland as one of the only ports in the state where a vessel can unload and access most of the necessary services in-between trips. Unloading in Portland also reduces transportation costs, as trucking fish to the Exchange becomes unnecessary. The Exchange services approximately 300 vessels and handles 20-30 million pounds of seafood products annually.

MARFIN – The MARFIN Report provides a detailed profile of Portland as well as a general demographic profile of Cumberland County, the county in which Portland is located. These profiles should be referenced for social and demographic data not contained in this document.

Maine became a state in 1820, and Portland became the capital. Portland has a rich history in commercial fishing, and it is considered an active port still today. Revenues from the commercial fishing industry may only represent about ten percent of the city's gross product, but commercial fishing is considered culturally important to the city. Portland showed its support for the presence of a strong commercial fishing industry when it helped establish the Portland Fish Exchange in 1987. Portland then became the first city on the East Coast with a display auction for the sale of fresh fish. After a somewhat rocky start, the Portland Fish Exchange has been very successful, and about 90% of groundfish landed in Portland goes through the auction.

According to the 1990 Census, 64,358 people lived in Portland in 1989. The racial and ethnic background of Portland citizens has been primarily English, French, and Irish, but experts predict that these figures will radically change in the 2000 Census. MARFIN reported that Portland has 21 processors of fresh and frozen seafood. Respondents estimated that 300-400 households are directly dependent on commercial fishing and about 1,500-2,000 households are indirectly dependent. MARFIN found that the majority of fishermen from Portland are from Maine and are year-round harvesters. It is interesting to note that the limiting factor in the growth of fish processing in Maine seems to be due more to labor shortages than lack of fish.

MARFIN reports that trawlers, longliners, and gillnetters have traditionally worked out of Portland. According to 1992 NMFS permit data, 68 commercial vessels were homeported in Portland, and in 1997 that number fell to 51. When groundfish fishermen faced cut backs in days-at-sea regulations, a number of large groundfish vessels switched to the herring, mackerel, and squid fisheries. Some smaller groundfish vessels turned to lobster fishing instead. The groundfish industry in Portland seems to be recuperating, and in 2000 there were at least 18 large groundfish boats. Another shift in the groundfish fleet has been in the pattern of ownership. The MARFIN Report found that before DAS limitations, most vessels in Portland were owner-operated; today more of Portland's groundfish fleet is comprised of owners of two and three vessels. Some key informants in the MARFIN survey indicated that the cumulative impacts of Amendment 5 and 7 are what has affected Portland the most. The top ten species landed in Portland in 1997 according to the MARFIN Report (in order of pounds landed) were: herring, lobster, shrimp, plaice, cod, witch flounder, pollock, monkfish, white hake and silver hake. The recreational fishing industry seems to be limited in Portland, but it was reported that there are five marinas in South Portland.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Portland, Maine on November 13, 2000, and residents from Portland and surrounding communities attended and submitted comments. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of Portland relate to the apparent polarization of the fishing industry in Portland (big boat/small boat, Individual DAS/Fleet DAS), a loss of new entrants in the fishery and problems finding and keeping crew, and concerns about safety resulting from adaptations that fishermen are making in the face of increasing regulations. The groundfish regulations that residents feel have produced the most significant social impacts in this community are the DAS allocations and reductions in DAS since Amendment 5. This community is home to many vessels with Individual DAS permits, and these boats have experienced a 50% reduction in their allocated DAS since Amendment 5. Comments concerning the social impacts of the DAS reductions relate to the loss of opportunity and flexibility for boats that are primarily dependent on the groundfish fishery and not involved in many alternative fisheries. Please see the complete meeting report for additional discussion of these and other important social impact issues.

Additional Community Information – The Portland Fish Exchange (PFE) publishes an annual report that details activity at the Exchange. These reports include information about prices, annual and monthly landings, cull sizes, and other important economic information. Information about the PFE can be obtained from its website, www.portlandfishexchange.com.

Fishing Activity in Portland, Maine

The number of active multispecies vessels landing fish in Portland peaked at 193 in 1996, but declined 27.5% overall from 1994 to 2001 (Table 575). The greatest decline in number of active vessels was 25.5%, from 1997 to 1998. Total landings in Portland increased greatly from 1994 to 1997, declining in the following year, and increasing continuously to a maximum of over 75 million pounds in 2001. The number of multispecies vessels landing groundfish increased as a percentage of the total number of active multispecies vessels from 1994 to 2001, but decreased overall during this period. Groundfish landings decreased from around 17 million pounds in 1994 to under 12 million in 1999, followed by a general increase from 1999 to 2001. Landings of small mesh non-multispecies (primarily herring) increased substantially from 3.7 million pounds in 1994 to 53.6 million pounds in 2001. Landings of other species remained consistent, while high value species landings generally declined.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	189	193	172	184	137	146	140	137
Number of Multispecies Vessels Landing Groundfish	139	131	119	148	110	113	109	117
TOTAL								
Landings	27,220.1	27,573.4	30,674.2	57,047.3	32,727.6	41,427.5	50,872.3	75,148.0
Revenues	$32,142.7	$30,968.6	$27,851.7	$24,168.6	$20,711.8	$24,767.4	$25,703.0	$24,647.2
GROUNDFISH								
Landings	17,010.7	15,002.0	14,608.9	13,958.3	12,652.8	11,953.4	15,591.6	17,229.3
Revenues	$21,195.9	$19,131.9	$16,840.8	$14,879.7	$14,673.4	$14,942.6	$16,563.4	$15,968.2
SMALL MESH MULTISPECIES								
Landings	1,322.9	1,906.4	3,219.8	1,179.6	147.3	143.2	18.2	27.3
Revenues	$460.0	$637.2	$1,187.9	$305.2	$46.7	$55.1	$9.4	$9.2
SMALL MESH NON-MULTISPECIES								
Landings	3,683.7	5,234.8	8,113.8	38,712.8	15,869.0	24,367.5	31,866.6	53,612.1
Revenues	$3,751.3	$4,382.7	$4,560.4	$4,848.8	$1,868.5	$3,021.1	$2,178.9	$3,273.0
OTHER SPECIES								
Landings	5,139.7	5,190.3	4,678.9	3,151.2	4,035.5	4,935.8	3,394.6	4,271.2
Revenues	$6,191.4	$5,856.4	$5,031.3	$3,978.1	$4,005.0	$6,557.9	$6,944.6	$5,364.2
HIGH VALUE SPECIES								
Landings	63.1	239.8	52.9	45.3	23.0	27.7	1.3	8.1
Revenues	$544.2	$960.4	$231.2	$156.9	$118.1	$190.7	$6.6	$32.5

Table 575 - Landings and Revenues from Multispecies Permit Holders in Portland, Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

Total number of vessels homeported in Portland declined substantially from 117 in 1994 to 76 in 2001 (Table 576). The number of active vessels from Portland landing any species also declined by 39% over this period, and active vessels landing groundfish decreased 29%. Total landings by Portland vessels decreased from 1994 to 1997, increased in the following year, and remained relatively stable after 1999, with landings slightly below the level in 1994. Groundfish landings declined through 1998, and increased afterwards. Dependence on groundfish as a percentage of total fishing revenues by multispecies vessels from Portland averaged 64.4% from 1994 to 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	117	107	98	82	68	84	82	76
TOTAL								
Number Active*	74	69	63	51	45	51	50	45
Landings	23,537.2	18,445.1	17,330.9	12,445.8	13,601.2	21,071.4	19,320.8	21,982.3
Revenues	$24,776.5	$20,750.7	$16,748.4	$11,717.9	$11,701.0	$16,943.0	$15,962.4	$14,533.4
GROUNDFISH								
Number Active**	62	57	55	45	40	46	46	44
Landings	12,414.5	9,783.3	9,125.6	7,049.8	6,625.9	8,149.8	10,009.6	11,298.0
Revenues	$15,350.2	$12,470.9	$10,287.3	$7,556.2	$7,617.3	$10,340.4	$10,773.7	$10,675.9
Multispecies Revenues as a percent of Total Revenues	62.0%	60.1%	61.4%	64.5%	65.1%	61.0%	67.5%	73.5%

Table 576 - Fishing Activity for Vessels Homeported in Portland, Maine

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases

9.4.5.6.3.2 Lower Mid-Coast 1, Maine

The Lower Mid-Coast 1, Maine group is a secondary multispecies port group that includes New Harbor, Bristol, South Bristol, Boothbay Harbor, East Boothbay, Medomak, Southport, and Westport. These communities are located in Lincoln County.

MARFIN – The MARFIN Report provides detailed profiles of South Bristol, Boothbay, Boothbay Harbor, and Southport. It also includes a general profile of the Lower Mid-Coast Maine sub-region and Lincoln County, the county in which the Lower Mid-Coast 1 communities are located. These profiles should be referenced for social and demographic data not contained in this document.

Social Impact Informational Meetings – Council staff conducted social impact informational meetings in Portland, Maine on November 13, 2000 and Ellsworth, Maine on December 7, 2000. A few residents from Lower Mid-Coast 1 communities attended the meeting in Portland and submitted comments. While attendance from these communities was not overwhelming, the information collected at these two social impact meetings may reflect, at least in part, the perspectives of the residents of these communities. The summary from these meetings can be found in Appendix I.

Fishing Activity in Lower Mid-Coast 1, Maine

By Port of Landing

The number of active permitted multispecies vessels in Lower Mid-Coast 1 declined steadily from 89 vessels in 1994 to 33 in 2001 (Table 577). The number of multispecies vessels landing groundfish declined overall, fluctuating throughout the time period. However, the number of multispecies vessels landing groundfish increased as a percentage of total active vessels, from 42% in 1994 to nearly 82% in 2001. Total landings in Lower Mid-Coast 1 generally decreased from 1994 to 2001. Groundfish landings declined from 1994 to 1999, followed by a large increase from 1999 to 2001 to a level comparable to that landed in 1995. Small mesh non-multispecies landings were relatively stable from 1994 to 1999 with a peak in 1996, followed by a steep decline after 1999. Small mesh non-multispecies landings made up the greatest proportion of total landings in most years, followed by groundfish. Small mesh multispecies landings dropped from about 53.8 million pounds in 1994 to zero in 2001, while other species landings were relatively stable. High value species also declined to zero landings by 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	89	72	66	48	45	37	36	33
Number of Multispecies Vessels Landing Groundfish	38	35	26	18	23	18	24	27
TOTAL								
Landings	4,280.9	4,148.6	5,296.4	2,961.4	2,940.6	2,855.3	1,425.2	1,396.5
Revenues	$4,185.8	$3,661.7	$2,846.5	$2,663.4	$1,500.4	$1,354.1	$1,677.3	$1,381.1
GROUNDFISH								
Landings	1,727.9	1,116.4	745.0	600.3	562.4	428.9	924.8	1,044.7
Revenues	$1,993.8	$1,300.0	$720.8	$606.0	$623.2	$482.6	$849.9	$911.8
SMALL MESH MULTISPECIES								
Landings	53.8	14.1	1.6	0.2	0.9	0.0	0.4	C
Revenues	$11.5	$4.3	$0.5	$0.0	$0.1	$0.0	$0.2	C
SMALL MESH NON-MULTISPECIES								
Landings	2,063.1	2,836.7	4,122.9	1,524.3	2,253.3	2,277.4	180.1	43.2
Revenues	$1,621.1	$1,961.6	$1,814.6	$1,425.8	$655.0	$575.8	$158.1	$49.3
OTHER SPECIES								
Landings	414.9	168.2	416.8	832.9	115.2	148.0	320.0	308.6
Revenues	$304.9	$202.3	$242.8	$603.8	$167.2	$287.7	$669.1	$420.0
HIGH VALUE SPECIES								
Landings	21.3	13.1	10.1	3.6	8.9	1.0	0.0	0.0
Revenues	$254.5	$193.5	$67.8	$27.8	$54.9	$8.1	$0.0	$0.0

Table 577 - Landings and Revenues from Multispecies Permit Holders in Lower Mid-Coast 1, Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The total number of permitted multispecies vessels homeported in Lower Mid-Coast 1 decreased over the period from 90 in 1994 to 48 in 2001 (Table 578). Of these, active vessels landing any species and those reporting landings of groundfish declined as well. Despite the decline in number of active vessels, total landings increased from 4.3 million pounds in 1994 to 6.2 million pounds in 1996. After 1996, landings decreased steadily. Groundfish landings fluctuated but remained relatively steady, with two low periods in 1997 and 1999. Groundfish landings were highest in 1994, at 1.8 million pounds. Dependence on revenues from groundfish was lowest in 1997, at 30.8% of total revenues and highest in 2001, at 58.2%.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	90	89	77	63	54	52	53	48
TOTAL								
Number Active*	57	50	49	35	32	22	24	21
Landings	4,300.4	4,281.7	6,234.9	5,492.4	3,532.8	3,790.8	2,401.2	2,284.8
Revenues	$4,504.8	$4,301.1	$4,128.3	$2,736.3	$2,210.9	$1,919.6	$3,412.2	$2,631.9
GROUNDFISH								
Number Active**	23	30	24	20	20	14	21	17
Landings	1,801.2	1,546.3	1,624.9	808.6	1,127.1	677.7	1,638.1	1,692.1
Revenues	$2,221.9	$1,982.9	$1,791.6	$842.4	$1,264.9	$785.8	$1,598.7	$1,532.4
Multispecies Revenues as a percent of Total Revenues	49.3%	46.1%	43.4%	30.8%	57.2%	40.9%	46.9%	58.2%

Table 578 - Fishing Activity for Vessels Homeported in Lower Mid-Coast 1, Maine

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases

9.4.5.6.3.3 Lower Mid-Coast 2, Maine

The Lower Mid-Coast 2, Maine group is a secondary multispecies port group that includes Cundys Harbor, Orrs Island, Yarmouth, Harpswell, East Harpswell, South Harpswell, Bailey Island, and Cape Elizabeth. These communities are located in Cumberland County.

MARFIN – The MARFIN Report provides detailed profiles of Harpswell, including South Harpswell and Cundys Harbor. It also includes a general profile of the Lower Mid-Coast Maine sub-region and Cumberland County, the county in which the Lower Mid-Coast 2 communities are located. These profiles should be referenced for social and demographic data not contained in this document.

Fishing Activity in Lower Mid-Coast 2, Maine

By Port of Landing

As in Lower Mid-Coast 1, the number of active multispecies vessels landing groundfish in Lower Mid-Coast 2 declined by over 50% from 1994 to 2001 (Table 579). Unlike the vessels landing groundfish in Lower Mid-Coast 1, however, the number of vessels landing groundfish in Lower Mid-Coast 2 increased from zero in 1994 to 14 in 2001, 82% of the total number of active multispecies vessels in that year. Total landings and revenues generally declined. Groundfish landings increased from zero in 1994 to 344,100 pounds in 2001, making up the majority of total landings in that year. Landings of small mesh non-multispecies, which composed the majority of total landings in most years, declined across the period as did high value species landings. As groundfish increased as a component of total landings in Lower Mid-Coast 2, high value and small mesh non-multispecies decreased.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	44	36	38	33	19	34	20	17
Number of Multispecies Vessels Landing Groundfish	0	5	1	8	6	6	9	14
TOTAL								
Landings	1,112.5	1,429.0	1,696.7	1,098.0	700.9	919.0	324.2	503.2
Revenues	$1,527.7	$1,480.3	$1,425.7	$936.4	$397.4	$649.1	$298.0	$467.4
GROUNDFISH								
Landings	0.0	8.7	C	29.1	25.1	38.1	121.2	344.1
Revenues	$0.0	$9.6	C	$33.2	$28.7	$41.7	$124.4	$305.1
SMALL MESH MULTISPECIES								
Landings	0.0	0.0	0.0	0.0	0.0	C	0.0	C
Revenues	$0.0	$0.0	$0.0	$0.0	$0.0	C	$0.0	C
SMALL MESH NON-MULTISPECIES								
Landings	1,072.7	1,390.0	1,630.6	918.7	586.8	853.2	169.7	97.7
Revenues	$1,033.2	$1,063.6	$1,238.3	$819.8	$287.1	$477.7	$106.3	$87.5
OTHER SPECIES								
Landings	0.0	1.6	C	145.8	79.0	15.3	33.3	59.8
Revenues	$0.0	$1.0	C	$42.8	$12.8	$30.4	$67.3	$72.7
HIGH VALUE SPECIES								
Landings	39.8	28.6	16.8	4.4	10.0	12.4	0.0	1.6
Revenues	$494.4	$406.1	$170.3	$40.6	$68.9	$99.2	$0.0	$2.0

Table 579 - Landings and Revenues from Multispecies Permit Holders in Lower Mid-Coast 2, Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

The numbers of total permitted multispecies vessels and those reporting landings of any species declined from 1994 to 2001, while the number of multispecies vessels landing groundfish increased over the period (Table 580). Total landings were relatively stable during the first two years of the time period, with a two-fold increase from 1996 to 1997, and a three-fold increase in landings from 1997 to 1998. Landings increased more gradually after 1998. Total revenues do not reflect this trend. Revenues remained fairly constant, with a slight downward trend overall, likely due to a decrease in landings of high value species. Groundfish landings decreased in the first two years and fluctuated for the remainder of the time period, with a slight overall positive trend. Dependence on groundfish by vessels homeported in Lower Mid-Coast 2 increased from 37% to 71% across the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	61	65	62	56	43	50	47	48
TOTAL								
Number Active*	33	27	33	28	17	25	21	22
Landings	3,030.8	2,924.5	3,190.4	6,242.4	2,000.3	2,310.3	2,448.7	3,206.5
Revenues	$3,565.8	$3,084.3	$3,006.5	$2,957.8	$2,160.6	$2,506.0	$3,007.3	$2,910.9
GROUNDFISH								
Number Active**	15	14	8	16	12	13	15	19
Landings	1,001.3	912.7	740.3	1,046.4	939.8	884.9	1,750.6	2,290.7
Revenues	$1,317.1	$1,250.2	$934.7	$1,282.7	$1,230.7	$1,151.1	$1,873.6	$2,063.8
Multispecies Revenues as a percent of Total Revenues	36.9%	40.5%	31.1%	43.4%	57.0%	45.9%	62.3%	70.9%

Table 580 - Fishing Activity for Vessels Homeported in Lower Mid-Coast 2, Maine
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.6.3.4 Lower Mid-Coast 3, Maine

The Lower Mid-Coast 3, Maine group is a secondary multispecies port group that includes Sebasco Estates, Small Point, West Point, Five Islands, and Phippsburg. These communities are located in Sagadahoc County.

MARFIN – The MARFIN Report provides a profile of Phippsburg, Maine. It also includes a general profile of the Lower Mid-Coast Maine sub-region and Sagadahoc County, the county in which the Lower Mid-Coast 3 communities are located. These profiles should be referenced for social and demographic data not contained in this document.

Fishing Activity in Lower Mid-Coast 3, Maine

By Port of Landing
The total number of active multispecies vessels landing fish in Lower Mid-Coast 3 declined 90% from 58 vessels in 1994 to only 6 in 2001 (Table 581). The number of multispecies vessels landing groundfish increased during the late 1990s, then declined to four vessels in 2001. As a percentage of total active vessels, vessels landing groundfish increased substantially, from 5% in 1994 to 67% in 2001. Total landings in Lower Mid-Coast 3 increased substantially from 1994 to 1995, then decreased continually in the following years, with an average annual percent decrease after 1995 of 34.6%. Revenues decreased from 1994 to 2001. After a dramatic increase in groundfish landings from 1994 to 1995 (36-fold increase), landings generally decreased in the following years. Small mesh non-multispecies landings followed a similar trend to groundfish landings, while high value species declined throughout the time period. While groundfish landings are increasing in Lower Mid-Coast 3, landings of other species groups appear to be declining.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	58	46	48	28	19	20	7	6
Number of Multispecies Vessels Landing Groundfish	3	16	20	16	10	3	2	4
TOTAL								
Landings	245.9	892.7	567.9	326.6	178.3	141.7	96.5	66.9
Revenues	$1,369.2	$1,360.4	$762.8	$462.3	$346.2	$229.1	$102.7	$65.7
GROUNDFISH								
Landings	3.0	108.3	71.5	48.0	46.2	13.4	C	36.5
Revenues	$4.1	$121.3	$55.1	$49.6	$57.9	$13.3	C	$31.6
SMALL MESH MULTISPECIES								
Landings	0.0	C	0.0	C	C	0.0	0.0	0.0
Revenues	$0.0	C	$0.0	C	C	$0.0	$0.0	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	127.6	712.9	458.9	241.3	89.9	109.6	48.3	18.3
Revenues	$116.3	$491.3	$431.0	$230.4	$76.3	$95.9	$43.7	$18.2
OTHER SPECIES								
Landings	1.0	14.9	10.3	17.5	9.1	4.0	6.0	11.9
Revenues	$0.9	$13.2	$6.3	$14.6	$10.8	$7.1	$15.4	$15.7
HIGH VALUE SPECIES								
Landings	114.3	56.5	27.1	18.6	30.1	14.7	C	C
Revenues	$1,240.3	$711.3	$265.5	$166.6	$200.9	$112.8	C	C

Table 581 - Landings and Revenues from Multispecies Permit Holders in Lower Mid-Coast 3, Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

The total number of permitted multispecies vessels as well as the numbers of multispecies vessels landing any species and those reporting landings of groundfish all declined from 1994 to 2001 (Table 582). Total landings and revenues decreased constantly, with only a very small increase in 2001. Groundfish landings declined through 1999 then increased through 2001, the 2001 landings only half the level reported in 1994. Dependence on groundfish increased over the period, as other species and high value species landings declined, from 21% in 1994 to 64% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	43	43	44	34	32	26	27	24
TOTAL								
Number Active*	33	31	31	24	18	12	4	5
Landings	1,318.5	1,170.0	798.0	503.1	259.8	253.7	206.9	226.4
Revenues	$1,797.8	$1,677.7	$1,049.7	$703.1	$460.4	$339.9	$248.8	$219.0
GROUNDFISH								
Number Active**	12	15	17	14	9	2	3	4
Landings	373.7	272.4	218.9	163.4	107.9	84.3	139.6	157.1
Revenues	$382.3	$325.4	$233.0	$189.9	$133.9	$96.5	$142.9	$140.4
Multispecies Revenues as a percent of Total Revenues	21.3%	19.4%	22.2%	27.0%	29.1%	28.4%	57.5%	64.1%

Table 582 - Fishing Activity for Vessels Homeported in Lower Mid-Coast 3, Maine
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.6.4 Southern Maine

The Southern Maine group is a secondary multispecies port group that includes York, York Harbor, Camp Ellis, Kennebunkport, Kittery, Cape Porpoise, Ogunquit, Saco, and Wells. These communities are located in York County.

MARFIN – The MARFIN Report provides detailed profiles of Kennebunkport and Cape Porpoise, Maine. It also includes a general profile of York County, the county in which the Southern Maine communities are located. These profiles should be referenced for social and demographic data not contained in this document.

The following is a description of the population, education, poverty, unemployment and fishing industry participation in York County.

York County	1990		2000		Percent change
Population (total individuals)	164,587		186,742		13.5%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	79.5%		86.5%		Difference = 7.0%
Poverty* (Number of families)	2,158		2,999		39.0%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	5,398	6.3%	3,429	3.5%	-36.5%

Table 583 - Population, education, poverty and unemployment statistics for York County, ME (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in York County increased 13.5% between 1990 and 2000 (Table 583). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 79.5% in 1990 to 86.5% in 2000, a rise of 7 percentage points over the period. The number of families living in poverty increased 39%, while the number of unemployed decreased 36.5% from 1990 to 2000. The unemployment rate declined from 6.3% of the labor force in 1990 to 3.5% in 2001.

Fishing Industry Employment in Southern Maine

York County

The number of individuals employed in fishing (1141) declined slightly from 1997 to 2000, averaging 390 during that period (Table 584). The average annual payroll for individuals in the fishing sector was $49,478 in 2000. The fish and seafood wholesale sector comprised the greatest number of establishments after the fishing sector, with an average of 20 establishments from 1998 to 2001. Only one establishment was reported in the seafood canning sector from 1998 to 2000, and zero in 2001. Seafood product preparation and packaging, fresh and frozen seafood processing, and fish and seafood markets sectors remained small but stable. These data demonstrate that the fishing industry remained an active, stable presence in York County during the late 1990s.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	414	391	391	362	NA
	Sum of Annual payroll	14,133	13,167	15,993	17,911	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	3	2	1
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	1	1	1	0
	Sum of Annual payroll	NA	E	E	E	0
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	2	1	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	20	19	21	20
	Sum of Annual payroll	NA	2,753	3,355	3,324	3,182
44522** Fish and seafood markets	Sum of Total Establishments	NA	4	5	5	6
	Sum of Annual payroll	NA	E	E	E	218

Table 584 - Employment in fishing and related industries in York County, ME (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Southern Maine

By Port of Landing

The number of active multispecies vessels (landing any species and groundfish) declined from 1994 to 2001 (Table 585). 100% of the active multispecies vessels reported landings of groundfish in 2001 (17 vessels). Total landings and revenues generally declined from 1994 to 2001, with some fluctuation. Groundfish landings fluctuated, dipping in 1995-1996, increasing through 1998, dropping again in 1999, and increasing to the highest landings of the period in 2000 and 2001. Small mesh non-multispecies, which made up almost 70% of total landings in 1994, declined substantially during the following years. Small mesh multispecies landings also declined, reported at low levels in all years. Landings of high value species fluctuated, with the highest reported landings in 2000 at 99.8 million pounds and the lowest in 2001, at zero.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	62	56	37	34	38	35	24	17
Number of Multispecies Vessels Landing Groundfish	20	14	8	13	16	14	19	17
TOTAL								
Landings	1,619.4	1,721.7	1,192.9	726.5	771.7	605.4	650.9	413.8
Revenues	$2,245.9	$1,824.2	$1,039.4	$751.8	$962.8	$756.8	$962.0	$369.7
GROUNDFISH								
Landings	317.8	281.2	127.2	239.0	384.8	154.7	324.6	365.0
Revenues	$378.2	$315.0	$108.9	$236.3	$418.3	$181.4	$328.7	$321.7
SMALL MESH MULTISPECIES								
Landings	21.3	66.6	36.8	2.3	7.3	1.8	1.3	3.9
Revenues	$5.4	$18.9	$10.5	$0.7	$0.9	$1.0	$0.4	$0.9
SMALL MESH NON-MULTISPECIES								
Landings	1,113.5	1,284.6	904.6	347.5	206.0	315.1	65.6	14.6
Revenues	$1,143.1	$961.9	$725.9	$328.0	$186.9	$275.9	$44.9	$12.7
OTHER SPECIES								
Landings	126.0	58.9	106.5	125.2	115.8	103.5	159.4	30.4
Revenues	$73.9	$40.3	$38.2	$74.1	$115.3	$137.3	$250.4	$34.5
HIGH VALUE SPECIES								
Landings	40.8	30.4	17.8	12.5	57.8	30.2	99.8	0.0
Revenues	$645.0	$487.3	$155.9	$112.6	$241.4	$161.3	$337.5	$0.0

Table 585 - Landings and Revenues from Multispecies Permit Holders in Southern Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The numbers of permitted multispecies vessels and those reporting landings of any species declined slightly from 1994 to 2001, while multispecies vessels reporting landings of groundfish increased in number over the period (Table 586). Half of the total number of active vessels reported landings of groundfish in 1994, while 100% of the active vessels landed groundfish in 2001. Total landings remained relatively consistent from 1994 to 2001, with a small overall decline across the period. After a slight decline from 1994 to 1995, groundfish landings increased from 499,800 pounds in 1996 to 1.4 million pounds in 2001. The greatest increase in landings occurred between 1996 and 1997 (85%). Dependence on groundfish revenues fluctuated to some extent across the period though generally increasing, reaching 74.7% of total revenues by 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	81	84	63	64	63	72	82	77
TOTAL								
Number Active*	32	32	25	33	34	37	27	24
Landings	2,422.8	2,634.5	2,025.0	2,022.2	1,722.2	2,144.1	2,284.0	1,733.0
Revenues	$2,068.6	$2,102.5	$1,403.5	$1,695.1	$1,736.7	$2,277.0	$2,471.5	$1,567.8
GROUNDFISH								
Number Active**	16	19	14	20	20	22	24	24
Landings	627.2	735.8	499.8	923.6	1,223.4	1,106.0	1,498.2	1,351.0
Revenues	$740.3	$821.7	$444.8	$902.5	$1,177.6	$1,208.8	$1,418.6	$1,171.0
Multispecies Revenues as a percent of Total Revenues	35.8%	39.1%	31.7%	53.2%	67.8%	53.1%	57.4%	74.7%

Table 586 - Fishing Activity for Vessels Homeported in Southern Maine
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.6.5 Other Maine

Data are reported for other ports in Maine that do not fall into Primary or Secondary Multispecies Port groups.

Fishing Industry Employment in Other Maine
The number of fishing establishments increased from 169 in 1997 to 185 in 1998, falling back to 169 in 1999 and increasing in 2000 (Table 587). For these other ports in Maine, average annual payroll for harvesters was low relative to other regions in Maine, at $19,954 in 2000. The fish and seafood wholesale and fish and seafood markets sectors remained stable, each with four establishments in nearly all years. There were three or fewer seafood product preparation and packaging and fresh and frozen seafood processing sectors. Seafood canning reported no establishments in all but one year from 1997 to 2000.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	169	185	169	174	NA
	Sum of Annual payroll	2,732	3,159	2,493	3,472	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	2	3	1
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	0	0	1	0
	Sum of Annual payroll	NA	0	0	E	0
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	2	2	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	4	4	4	4
	Sum of Annual payroll	NA	E	E	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	4	4	4	6
	Sum of Annual payroll	NA	E	101	91	114

Table 587 - Employment in fishing and related industries in Other ME (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity for Other Maine

By Port of Landing

The number of multispecies vessels landing fish decreased 72% from 137 in 1994 to 38 in 2001 (Table 588). The number of multispecies vessels landing groundfish also declined, to only 6 vessels in 2001. Total landings increased from 2.1 million pounds in 1994 to 771,000 pounds in 1996, but demonstrated a 19-fold increase in the following year to 14.6 million pounds. Landings fluctuated from 1998 to 2001, with a peak during the period of 31.6 million pounds (1999). Groundfish landings declined from 1994 to 1997, doubled from 1997 to 1998, and declined again in the following years. Small mesh non-multispecies landings composed the majority of the total landings in all years and heavily influenced the total landings trend. Landings of groundfish, other species and high value species made up similar proportions of total landings. Small mesh multispecies landings dropped rapidly to zero after 1994, when they composed the second greatest percentage of the total landings.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	137	130	124	91	73	70	41	38
Number of Multispecies Vessels Landing Groundfish	37	20	24	24	34	17	16	6
TOTAL								
Landings	2,143.8	1,357.4	770.9	14,626.6	4,603.0	31,596.6	23,314.0	16,518.8
Revenues	$2,980.2	$2,598.2	$1,886.2	$1,834.8	$1,007.2	$2,738.9	$1,780.6	$1,150.7
GROUNDFISH								
Landings	372.2	128.2	163.9	133.3	284.9	104.6	111.0	10.6
Revenues	$331.1	$143.7	$153.7	$124.7	$272.0	$115.9	$98.1	$11.6
SMALL MESH MULTISPECIES								
Landings	587.8	C	2.6	C	0.1	C	C	0.0
Revenues	$77.6	C	$0.8	C	$0.0	C	C	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	899.4	954.3	287.9	14,317.8	4,216.8	31,414.5	23,130.8	16,466.5
Revenues	$794.6	$707.6	$207.9	$835.1	$326.3	$2,330.7	$1,489.2	$1,027.2
OTHER SPECIES								
Landings	146.4	153.6	186.4	83.8	51.3	48.4	68.0	40.2
Revenues	$267.9	$509.5	$527.0	$187.2	$82.8	$85.8	$170.4	$106.7
HIGH VALUE SPECIES								
Landings	138.0	121.2	130.1	90.7	49.8	29.0	4.1	1.4
Revenues	$1,509.0	$1,237.4	$996.8	$687.6	$326.0	$206.5	$22.8	$5.2

Table 588 - Landings and Revenues from Multispecies Permit Holders in Other Maine (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

As with the numbers of vessels landing fish in other Maine ports, the number of vessels homeported in these places also declined (Table 589). Total landings increased nearly 6-fold from 1994 to 2001. Groundfish landings generally increased as well, though the magnitude of the increase was much smaller. Dependence on groundfish in Other Maine remained fairly consistent throughout the time period, with an annual average of 25.7%.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	261	279	270	183	153	168	196	197
TOTAL								
Number Active*	104	116	120	79	58	53	44	45
Landings	8,195.3	13,483.6	11,091.1	52,226.8	32,380.4	37,172.3	35,180.9	46,308.3
Revenues	$5,210.8	$5,193.3	$4,844.3	$7,101.5	$4,501.5	$4,834.8	$4,719.1	$5,613.1
GROUNDFISH								
Number Active**	33	31	30	32	21	13	18	20
Landings	1,290.2	908.3	1,242.8	2,065.9	1,250.0	808.0	1,161.2	1,537.8
Revenues	$1,557.9	$1,087.6	$1,172.4	$2,055.3	$1,433.8	$1,005.1	$1,173.7	$1,350.5
Multispecies Revenues as a percent of Total Revenues	29.9%	20.9%	24.2%	28.9%	31.9%	20.8%	24.9%	24.1%

Table 589 - Fishing Activity for Vessels Homeported in Other Maine

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases

9.4.5.6.6 Maine Summary

Maine's downeast coastal counties experienced the greatest economic declines, with increases in poverty and unemployment from 1990 to 2000. South of Hancock County, poverty and unemployment levels declined. Groundfish are among the most substantial components of total landed catch in Maine, together with Other Species, High Value Species (lobster) and Small Mesh Non-multispecies (herring). Landings of small mesh non-multispecies generally increased in Maine. As a percentage of total revenues generated by multispecies vessels, groundfish revenues decreased in the regions furthest to the northeast and increased to the southwest. Portland, one of Maine's primary groundfish ports, experienced a marked decline in the number of active multispecies vessels landing fish and the number of multispecies vessels homeported there. However, groundfish revenues as a percentage of total revenues increased, demonstrating an increase in dependence on groundfish in Portland. Maine more nonemployer establishments in the fishing sector than any other state from 1997 to 2000. The fish and seafood wholesale sector reported the second greatest number of establishments after the fishing sector in Maine. As in other states, multispecies permit holders have increased their activity in the groundfish fishery since 1994.

9.4.5.7 New Hampshire

Demographic Profile of New Hampshire

NEW HAMPSHIRE	1990		2000		Percent change
Population (total individuals)	1,109,252		1,235,786		11.4%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	82.2%		87.4%		Difference = 5.2%
Poverty* (Number of families)	12,842		13,948		8.6%
	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
Unemployment (Pop. 16 yrs and over)	38,108	6.2%	25,500	3.8%	-33.1%

Table 590 - Population, education, poverty and unemployment statistics for the state of New Hampshire (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Total population in New Hampshire increased 11.4% from 1990 to 2000, a greater percent increase than in the state of Maine (Table 590). By 2000, total population in NH was comparable to that in ME. The percentage of individuals 25+ years graduating from high school or higher also increased in New Hampshire over the decade. The number of families in poverty increased 8.6% but unemployment dropped from 6.2% of the civilian labor force to 3.8% between 1990 and 2000.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
NEW HAMPSHIRE	1,235,786	1,222,572	1,186,851	9,035	2,964	15,931	371	7,420	13,214	20,489
COUNTY										
Belknap County	56,325	55,730	54,979	165	170	311	13	92	595	418
Carroll County	43,666	43,331	42,890	73	122	167	4	75	335	209
Cheshire County	73,825	73,171	72,167	271	226	350	26	131	654	529
Coos County	33,111	32,780	32,466	40	93	123	5	53	331	201
Grafton County	81,743	80,717	78,276	435	255	1,414	22	315	1,026	914
Hillsborough County	380,841	376,181	357,615	4,904	943	7,601	112	5,006	4,660	12,166
Merrimack County	136,225	134,810	132,254	730	311	1,171	29	315	1,415	1,362
Rockingham County	**277,359**	**274,816**	**268,486**	**1,619**	**487**	**3,084**	**98**	**1,042**	**2,543**	**3,314**
Strafford County	**112,233**	**110,959**	**108,073**	**702**	**238**	**1,560**	**53**	**333**	**1,274**	**1,155**
Sullivan County	40,458	40,077	39,645	96	119	150	9	58	381	221

Table 591 - Population by race in New Hampshire counties, 2000
Counties examined in Fishing Communities section of AHE in bold type.

Data source: U.S. Census Bureau

The population of New Hampshire is 96% white, with 1.1% of the individuals being of two or more races, 1.7% Hispanic of any race, and just under 3% represented by all other races combined (Table 591). The racial profiles of Rockingham and Strafford counties are similar, although the total population of Rockingham is over twice that of Strafford. The population of each county is just over 96% white, with 0.6% black/African American, 0.2% American Indian and Alaska Native, 1.1-1.4% Asian, 0.9-1.1% of two or more races, and 1-1.2% Hispanic/Latino of any race. There are no native Hawaiians and other Pacific Islanders, and 0.3-0.4% other races. In New Hampshire, Rockingham and Strafford counties are among those with the highest percentage of non-whites, after Hillsborough and Grafton counties.

Rockingham County	1990		2000		Percent change
Population (total individuals)	245,845		277,359		12.8%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	86.2%		90.5%		Difference = 4.3%
Poverty* (Number of families)	2,114		2,320		9.7%
	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
Unemployment (Pop. 16 yrs and over)	8,378	6.0%	4,182	2.7%	-50.1%

Table 592 - Population, education, poverty and unemployment statistics for Rockingham County, NH (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Portsmouth, Rye, Seabrook and Hampton are located in Rockingham County. The total population in Rockingham County increased 12.8% between 1990 and 2000 (Table 592). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 86.2% in 1990 to 90.5% in 2000, a rise of 4.3 percentage points over the period. The number of families living in poverty increased 9.7%, while the number of unemployed decreased over 50% from 1990 to 2000. The unemployment rate declined from 6.0% of the labor force in 1990 to 2.7% in 2001.

Strafford County	1990		2000		Percent change
Population (total individuals)	104,233		112,233		7.7%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	79.8%		86.4%		Difference = 6.6%
Poverty* (Number of families)	1,335		1,401		4.9%
	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
Unemployment (Pop. 16 yrs and over)	3,748	6.6%	2,351	4.1%	-37.3%

Table 593 - Population, education, poverty and unemployment statistics for Strafford County, NH (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Total population of Strafford County is about half that of Rockingham County and increasing at a slower rate (Table 593). Educational attainment is lower than that in Rockingham, with 79.8% of the population 25 years and older graduating from high school or higher in 1990, increasing to 86.4% in 2000. The number of families living in poverty increased nearly 5%, while number of unemployed fell about 37%. Unemployment rate declined from 6.6% to 4.1% from 1990 to 2000.

Fishing Industry Employment in Rockingham and Strafford Counties

Rockingham County

The number of individuals/establishments employed by fishing in Rockingham County declined 14% (34 establishments) from 1997 to 2000 (Table 594). In 2000, the average payroll for members of the fishing sector was $87,604. The second largest fishing-related sector in Rockingham County is the fish and seafood wholesale sector, with 12 establishments in 1998 declining to 9 in 2001. Seafood product preparation and packaging and fish and seafood markets each reported 5 to 6 establishments in each year. There were four establishments in fresh and frozen seafood processing from 1998 to 2000, this number decreasing to three in 2001. Two establishments were reported in the seafood canning sector in all years from 1998 to 2001. Most fishing-related sectors remained stable during this period.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	241	235	214	207	NA
	Sum of Annual payroll	16,851	15,055	16,022	18,134	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	6	6	6	5
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	4	4	4	3
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	12	12	10	9
	Sum of Annual payroll	NA	1,834	1,554	1,624	1,842
44522** Fish and seafood markets	Sum of Total Establishments	NA	5	5	5	6
	Sum of Annual payroll	NA	E	1,031	1,156	1,074

Table 594 - Employment in fishing and related industries in Rockingham County, NH (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Strafford County

The fishing industry has far less of a presence in Strafford County, without major ports like those situated in Rockingham County. The number of individuals or establishments in fishing was not reported in 1997, and demonstrated relative stability from 1998 to 2000, numbering from 34 to 41 in each of those years (Table 595). The average annual payroll in fishing during 2000 was $33,073, far lower than the average in Rockingham. Seafood product preparation and packaging and fresh and frozen seafood processing sectors reported one establishment in each year from 1998 to 2001. Fish and seafood wholesale reported two establishments annually from 1998 to 2000 and one in 2001. After 1998, there were no reported fish and seafood markets in Strafford County.

NAICS Code and Description		**1997**	**1998**	**1999**	**2000**	**2001**
1141* Fishing	Sum of Total Establishments	D	40	34	41	NA
	Sum of Annual payroll	D	1,090	1,017	1,356	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	2	2	2	1
	Sum of Annual payroll	NA	E	E	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	1	0	0	0
	Sum of Annual payroll	NA	E	0	0	0

Table 595 - Employment in fishing and related industries in Strafford County, NH (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.7.1 Portsmouth, NH

Portsmouth, New Hampshire has been identified as a primary multispecies port and is located in Rockingham County.

MARFIN – The MARFIN Report provides a detailed profile of Portsmouth, New Hampshire. It also includes a general profile of the New Hampshire Seacoast sub-region and Rockingham County, the county in which Portsmouth is located. These profiles should be referenced for social and demographic data not contained in this document.

Portsmouth sits near the mouth of the Piscataqua River, which divides NH and Maine. Portsmouth has a long maritime history, and by 1820 there were approximately 500 men fishing on 150-200 vessels based out of Portsmouth. Portsmouth is the largest fishing port along New Hampshire's eighteen-mile coastline. The primary components of the fishing infrastructure are the State Pier and adjoining fish co-op. In general, the city of Portsmouth is supportive of the commercial fishing sector, recognizing its cultural significance and its waterfront attraction for tourists. MARFIN reported that Portsmouth does have a concentrated amount of support services including four lobster bait houses, two boat builders, two boat yards, five fish retailers, and many other indirect commercial fishing industries.

MARFIN found that about 26 finfish vessels and 50 lobster boats are from Portsmouth. It was estimated that 200 households are directly dependent on commercial fishing, and 300 or so are indirectly dependent on commercial fishing. Aquaculture is becoming a significant industry in this port. GreatBay Aquafarms, Inc. focuses on raising fluke and summer flounder; it employs roughly six full-time employees and six part-time employees. New Hampshire Sea Grant has an extension office in Portsmouth and they work closely with the fishing industry on a number of research programs.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Portsmouth, New Hampshire on November 6, 2000. Several residents of Portsmouth and other NH Seacoast communities attended and submitted comments. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meeting, the most important social impact issues for residents of Portsmouth and other NH Seacoast communities relate to a loss of morale in the fishing industry (primarily from regulatory discarding), stress from uncertainty and the inability to plan business, problems finding and keeping crew, and safety concerns. The groundfish regulations that residents feel have produced the most significant social impacts are the Gulf of Maine rolling closures and the low Gulf of Maine cod trip limits, all of which have occurred since the start of the 1998 fishing year. Please see the complete meeting report in Appendix I for additional discussion of these and other important social impact issues.

Additional Community Information – Portsmouth's fishing industry is supported by a state pier and an adjoining fish cooperative. In August of 2000, Council staff had the opportunity to interview the general manager and the president of the Portsmouth Co-op. The bullets below summarize some interesting information about activity at the co-op (from August 2000 Council staff interview with president and general manager of co-op):

- The Portsmouth Fishermen's Co-op was established in 1978. It was the first co-op in New Hampshire.
- Membership in the co-op is at about 28, and this has remained relatively consistent over time. The total number of boats serviced by the co-op is about 38 (28 member boats and 10 non-member boats). Eight boats that fish out of Rye, NH truck their fish to the co-op, and three boats from York, ME use the co-op (two of them tie-up at the co-op instead of York).
- Sixteen members dock their boats at the co-op. Dock space is pretty tight because it is limited by the depth of the harbor. The harbor is not deep enough to dock a vessel greater than about 60 feet in length (without additional dredging).
- Member vessels in the co-op are about 50% gillnetters and 50% draggers, with about 4-5 boats that switch between the two gear types on a seasonal basis. All of the member boats are between 40-60 feet in length. The draggers tend to be the more "inshore" boats (about four of them fish offshore), and the gillnetters tend to be the more "offshore" boats. All inshore trips are day trips (less than 24 hours), and the offshore trips run about 3-7 days. There are currently no hook boats at the co-op, although many inshore boats used to hook fish on Jeffreys in the wintertime (this practice stopped with the establishment of the western Gulf of Maine closure).
- About 12 of the member boats are truly "offshore boats" – they usually work with four people on board, including the captain. The "inshore" draggers tend to work alone (just the captain), and the gillnetters tend to work with 2-3 people, including the captain.
- The president and general manager noted that many of the co-op boats have learned to adapt to increasing regulations in groundfish and other fisheries. Many of their members have opted to fish farther offshore or find another way to make a living (some have made fishing a part-time job). They

have also seen some of their members upgrade their vessels to make them capable of going offshore (at least one per year).

- The general manager noted a problem in finding employees for the co-op, and he cited the current status of the economy as one reason. He is having a hard time finding anyone who wants to work at the co-op when other, less labor-intensive jobs are available for similar or more money. He also noted that there are not very many young people entering the industry anymore, and it is becoming increasingly difficult to find relatively inexpensive labor. Sometimes, the co-op cannot handle the volume of fish that is landed because of the timing of the landings and the lack of a sufficient number of employees. When this happens, many boats have to wait for long periods of time to unload.
- The general manager also noted that the volume of fish landings has increased in the past year or so (not necessarily groundfish), and that this has been a problem not only for the co-op (in terms of having the employees to handle the volume), but also for the auctions, buyers, and processors. No one is currently prepared to handle the increase in volume, and as a result, the prices for fish have been very low. In fact, he noted that during the month of July 2000, volume could have been double what it was, but a lot of people tied-up and didn't fish because the prices were so bad.
- The biggest change since Amendment 5 that the general manager and president noted was the transition of about ½ of their member boats from inshore dayboats to offshore trip boats without an increase in vessel size (a lot of these boats made safety, etc. upgrades to go further offshore, but very few made length upgrades). They also noted that this has resulted in the co-op "losing its edge" on some of the fresh fish markets it used to be heavily involved with because these markets are seeking "day old" fish.
- Other services at the co-op (for members and non-members) include ice, fuel, and bait. There is also a gear storage area and a haul-out across the river in Kittery. The haul-out is likely to be sold in the near future for condo development, and the general manager and president are concerned because it is the only nearby place that is equipped to handle commercial vessels. There are two other nearby places to haul-out, but vessel owners are required to use specific sub-contractors at those places, and they are much more equipped for yachts and pleasure boats. They feel that this could be a problem for the Portsmouth commercial fleet in the near future.

Fishing Activity in Portsmouth, NH

By Port of Landing

The total numbers of permitted multispecies vessels reporting landings of any species and those reporting groundfish landings in Portsmouth increased overall from 1994 to 2001 (Table 596). The number of active vessels declined from 1995 to 1998, increased 1998 to 2000, and declined slightly in 2001. The number of multispecies vessels reporting landings of groundfish increased 50% from 46 in 1994 to 69 in 2001. Total landings were relatively stable from 1994 to 1996, declined from 1996 to 1999, and increased again in 2000. Overall, reported landings during this time period demonstrated a relatively flat trend. Groundfish landings made up the majority of the total landings in Portsmouth. The lowest groundfish landings were reported in 1998 and 1999 and landings demonstrated a general decline overall. Landings of small mesh multispecies, small mesh non-multispecies, and other species did not demonstrate any strong positive or negative trends, fluctuating across the period. High value species landings increased substantially from 1999 to 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	65	68	57	50	55	59	83	77
Number of Multispecies Vessels Landing Groundfish	46	57	44	41	43	50	73	69
TOTAL								
Landings	6,141.9	6,656.3	6,098.1	4,923.8	3,606.3	3,732.8	6,677.9	4,304.7
Revenues	$5,064.2	$5,474.0	$4,733.2	$3,846.0	$3,017.6	$3,707.5	$5,266.0	$4,370.7
GROUNDFISH								
Landings	3,431.8	3,123.9	3,175.8	2,711.3	1,935.5	2,037.6	2,492.1	2,301.0
Revenues	$3,703.8	$3,300.7	$2,750.8	$2,296.8	$2,091.4	$2,100.1	$2,330.9	$1,970.2
SMALL MESH MULTISPECIES								
Landings	119.2	89.4	185.2	73.4	22.0	27.3	134.0	32.4
Revenues	$52.0	$37.9	$67.7	$22.3	$6.9	$10.0	$42.1	$9.1
SMALL MESH NON-MULTISPECIES								
Landings	554.0	1,193.0	1,129.0	740.6	385.0	229.5	1,044.6	172.4
Revenues	$506.6	$926.9	$896.6	$563.6	$136.6	$117.1	$172.4	$17.5
OTHER SPECIES								
Landings	2,023.6	2,243.1	1,603.1	1,392.0	1,253.8	1,434.6	2,979.2	1,759.8
Revenues	$677.6	$1,128.4	$964.3	$920.9	$708.2	$1,455.5	$2,575.4	$2,233.4
HIGH VALUE SPECIES								
Landings	13.3	6.9	5.0	6.4	10.1	3.7	27.9	39.1
Revenues	$124.1	$80.1	$53.9	$42.4	$74.5	$24.8	$145.1	$140.5

Table 596 - Landings and Revenues from Multispecies Permit Holders in Portsmouth, NH (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homemport

The number of vessels homeported in Portsmouth remained relatively stable from 1994 to 2001 (Table 597). There was a slight decline in active vessels after 1994, with an increase back to 1994 levels around 1999. Total landings were stable from 1994 to 1999, then demonstrated a four-fold increase from 1999 to 2000, increasing an additional 78% from 2000 to 2001. Groundfish landings fluctuated very little from 1994 to 2001, exhibiting a slightly positive overall trend during this period. Dependence on groundfish declined over the period, with a peak of 74% in 1998. Portsmouth multispecies vessels exhibited the lowest dependence in 2000 and 2001 due to an increase in landings of small mesh non-multispecies and high value species during those years.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	52	49	45	39	40	42	56	57
TOTAL								
Number Active*	35	28	28	27	30	30	39	35
Landings	3,911.7	4,526.1	3,839.7	3,788.0	4,273.4	3,075.3	12,241.7	21,776.3
Revenues	$3,465.6	$3,471.5	$2,776.4	$2,864.9	$3,339.5	$3,056.4	$5,219.2	$5,577.8
GROUNDFISH								
Number Active**	31	25	24	25	25	28	36	30
Landings	2,108.5	2,003.5	1,636.1	2,155.7	2,324.4	1,873.8	2,472.8	2,558.4
Revenues	$2,312.6	$1,862.6	$1,540.8	$1,898.8	$2,472.4	$1,932.4	$2,405.1	$2,208.9
Multispecies Revenues as a percent of Total Revenues	66.7%	53.7%	55.5%	66.3%	74.0%	63.2%	46.1%	39.6%

Table 597 - Fishing Activity for Vessels Homeported in Portsmouth, NH
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.7.2 NH Seacoast

The New Hampshire Seacoast group is a secondary multispecies port group that includes Rye, Hampton, and Seabrook. These communities are located in Rockingham County.

MARFIN – The MARFIN Report provides detailed profiles of Hampton and Seabrook, NH. It also includes a general profile of the NH Seacoast sub-region and Rockingham County, the county in which the NH Seacoast communities are located. These profiles should be referenced for social and demographic data not contained in this document.

MARFIN ranked the NH Seacoast with a low overall economic dependence on fishing due to the intense coastal development and diversified economic activity in the area. However, the Hampton/Seabrook port has a vibrant commercial fishing industry. Furthermore, MARFIN documented that Rye is still a significant fishing port with 24 or more vessels, 2-10 groundfish and over 12 lobster vessels. One important factor that has helped many New Hampshire ports survive is their close proximity to rich fishing grounds compared to other ports in the North Atlantic.

Hampton Beach and Seabrook are located just north of the Massachusetts border. This area is known as a "summer vacation community." The year-round population is 13,100, and the summer visitors are estimated to reach 150,000 individuals. The recreational sector is not considered a dominant activity in this area; however, the party/charter sector in both Rye and Hampton is significant. There are substantial support services in the area such as ice supplies, bait houses, and a local netmaker for repairs. MARFIN estimated that 70 families are directly dependent on commercial fishing in the Hampton/Seabrook area. About 40% of those individuals sought seasonal work outside of the industry when fishing restrictions were imposed, but returned when restrictions were lifted. MARFIN reported an important difference when the fishermen returned however – now most fishermen work alone, whereas before the restrictions, almost all vessels had at least one crewmember.

In 1978, there were 35 lobster boats and a dozen or so gillnetters, bottom trawlers, and purse seine vessels working out of Hampton Harbor. MARFIN determined that twenty years later, the number of vessels has remain essentially unchanged; today, there are 36 lobster boats, four gillnetters, and ten draggers. It is important to note that six out of ten draggers have become inactive due to closures and other restrictions on catch. There is less groundfishing in the area, but shrimping has increased to the extent allowed, and lobstering has boomed. Both the fleet and the local coop have diversified significantly over time to stay in business. In 1997, the Newburyport Co-op merged with the local co-op, and today the Yankee Co-op in Seabrook has 59 members. MARFIN reported that most of the product from the Co-op is sold to regional buyers in Boston, Gloucester, and Saugus. No one interviewed in this area by MARFIN encourages his or her children to go into the commercial fishing business because of the economic uncertainty.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Portsmouth, NH on November 6, 2000. A few residents from NH Seacoast communities attended and submitted comments. The summary from these meetings can be found in Appendix I.

Fishing Activity on the NH Seacoast

By Port of Landing

The number of active multispecies vessels declined from 1994 to 1996, increasing to 36 active vessels in 2001, 29 of these reporting groundfish landings (Table 598). Total landings declined substantially from 1.4 million pounds in 1994 to only 4,000 pounds in 1996. Landings generally increased after 1996 to almost 1.2 million pounds in 2001. Groundfish landings declined rapidly from 359,000 pounds in 1994 to zero in 1996, and generally increased from 1996 to 2001. Landings of all species declined to zero in 1996, with the exception of high value species.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	14	11	1	7	21	12	15	36
Number of Multispecies Vessels Landing Groundfish	10	9	0	7	15	10	14	29
TOTAL								
Landings	1,370.6	339.1	C	283.5	728.8	656.1	1,213.9	1,192.1
Revenues	$926.7	$251.2	C	$276.0	$548.5	$481.3	$971.1	$1,259.8
GROUNDFISH								
Landings	359.2	179.9	0.0	85.1	249.6	111.1	421.0	655.6
Revenues	$383.0	$187.8	$0.0	$81.9	$287.5	$105.8	$469.9	$702.8
SMALL MESH MULTISPECIES								
Landings	8.1	20.2	0.0	12.7	12.8	27.9	34.0	19.9
Revenues	$3.9	$2.3	$0.0	$3.9	$3.9	$10.3	$11.5	$4.2
SMALL MESH NON-MULTISPECIES								
Landings	411.3	0.2	0.0	136.6	126.6	245.3	85.5	81.6
Revenues	$391.4	$0.1	$0.0	$127.5	$81.0	$116.1	$61.4	$91.0
OTHER SPECIES								
Landings	589.5	137.4	0.0	43.6	327.1	268.9	673.3	431.0
Revenues	$129.7	$43.0	$0.0	$11.0	$92.0	$227.3	$428.3	$446.1
HIGH VALUE SPECIES								
Landings	2.5	1.4	C	5.5	12.7	2.8	0.0	4.0
Revenues	$18.8	$18.0	C	$51.7	$84.1	$21.7	$0.0	$15.7

Table 598 - Landings and Revenues from Multispecies Permit Holders in NH Seacoast Group (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.
Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.
Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.
Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.
High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.
C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**
Data source: NMFS Permit and Dealer databases.

By Homeport
The number of permitted multispecies vessels from the New Hampshire Seacoast group declined from 1994 to 2001 (Table 599). While the total number of active vessels declined over the time period, the fraction of these reporting groundfish landings increased, with all but two of the 53 active vessels landing groundfish in 2001. Total landings and revenues generally declined from 1994 to 2001. Groundfish landings declined each year from 1994 to 1999, then doubled from 1999 to 2001. The percent of groundfish revenues making up the total revenues in 1994 was 38.7%, and increased to about 50% in 1998. After a one-year decline in 1999, dependence increased to over 60% in 2001. Groundfish have become a more important source of income to New Hampshire Seacoast fishermen.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	130	123	109	99	85	88	92	104
TOTAL								
Number Active*	71	60	51	47	47	47	48	53
Landings	5,674.1	5,169.6	4,016.1	3,525.1	3,681.2	3,128.8	3,695.4	3,613.4
Revenues	$4,562.0	$4,160.9	$3,245.9	$2,962.4	$3,303.7	$3,160.1	$3,561.4	$3,664.2
GROUNDFISH								
Number Active**	39	44	34	32	39	35	46	51
Landings	1,626.7	1,617.2	1,575.0	1,567.8	1,482.9	1,050.3	1,768.5	2,162.8
Revenues	$1,767.6	$1,709.5	$1,366.0	$1,388.2	$1,659.3	$1,118.1	$1,882.5	$2,204.5
Multispecies Revenues as a percent of Total Revenues	38.7%	41.1%	42.1%	46.9%	50.2%	35.4%	52.9%	60.2%

Table 599 - Fishing Activity for Vessels Homeported in NH Seacoast Group
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.7.3 Other New Hampshire

Fishing Industry Employment in Other New Hampshire
The number of individuals engaged in fishing in all other coastal regions of New Hampshire declined from 1997 to 1999 and was stable from 1999 to 2000 (Table 600). The annual payroll for fishing individuals/establishments was $21,196 in 2000. All other sectors reported between 1 and 4 establishments in each year from 1998 to 2001. No seafood canning establishments were reported in any years from 1998 to 2001.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	77	41	56	56	NA
	Sum of Annual payroll	1,848	641	1,083	1,187	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	1	3	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	1	3	2
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	3	2	2	4
	Sum of Annual payroll	NA	E	E	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	1	2	2	3
	Sum of Annual payroll	NA	E	E	E	E

Table 600 - Employment in fishing and related industries in Other NH (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Other NH

By Port of Landing

The number of active multispecies vessels declined from 80 in 1994 to 61 in 2001 (Table 601). Out of these active vessels, the number landing groundfish increased from 38 in 1994 to 47 in 2001, or 77% of total active vessels. Total landings declined from 1994 to 1997, increasing in subsequent years. From 1997 to 2001, landings increased 400%. The change in revenues was much less dramatic, the trend remaining relatively flat across the time period. The rise in total landings resulted from a substantial increase in small mesh non-multispecies landings from 1998 to 2001; this increase did not greatly affect total revenues since small mesh non-multispecies are low value species. Groundfish landings remained very stable from 1994 to 1999, increasing 79% from 1999 to 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	80	82	80	55	58	49	56	61
Number of Multispecies Vessels Landing Groundfish	38	51	39	26	34	26	39	47
TOTAL								
Landings	3,225.0	2,737.5	2,154.2	1,798.9	1,829.6	4,812.2	5,662.1	8,589.5
Revenues	$2,695.7	$2,639.2	$1,992.3	$1,820.9	$1,623.2	$2,292.0	$2,429.9	$2,500.2
GROUNDFISH								
Landings	607.9	734.5	753.9	709.7	624.7	578.2	875.1	1,033.8
Revenues	$699.0	$794.9	$670.3	$705.1	$728.9	$652.2	$981.2	$1,133.4
SMALL MESH MULTISPECIES								
Landings	143.4	100.4	159.2	132.3	81.1	177.3	196.6	241.8
Revenues	$42.5	$35.7	$66.3	$45.9	$32.5	$84.0	$77.4	$101.6
SMALL MESH NON-MULTISPECIES								
Landings	1,205.9	539.3	306.1	330.4	232.0	3,385.0	4,045.4	6,843.1
Revenues	$731.7	$393.8	$249.9	$285.0	$160.0	$358.8	$374.5	$373.8
OTHER SPECIES								
Landings	1,134.3	1,218.8	793.1	521.9	785.0	499.4	380.2	271.7
Revenues	$223.4	$263.5	$201.9	$150.1	$163.3	$207.4	$320.6	$190.8
HIGH VALUE SPECIES								
Landings	133.6	144.6	141.9	104.6	106.9	172.3	164.9	199.1
Revenues	$999.0	$1,151.2	$803.8	$634.8	$538.5	$989.6	$676.2	$700.5

Table 601 - Landings and Revenues from Multispecies Permit Holders in Other New Hampshire (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

Total number of permitted multispecies homeported in Other NH decreased from 1994 to 1998, remained steady for the next two years, and increased slightly in 2001 (Table 602). The number of active vessels, including those landing groundfish, declined as well. Total landings decreased from 1994 to 2001, with an annual average reduction of 13.7%. Groundfish landings declined gradually from 1994 to 1996, then dropped substantially in 1997, a 67% decline from the previous year. Landings of groundfish remained somewhat stable for the duration of the period. Dependence on groundfish generally fluctuated, with a high of 73% in 1994 and a low of 33% in 1997.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	64	63	47	35	31	31	32	40
TOTAL								
Number Active*	25	29	28	19	19	15	15	16
Landings	2,058.0	1,947.1	2,149.5	1,165.8	1,178.9	515.6	595.2	503.2
Revenues	$1,947.2	$2,053.7	$1,809.4	$1,149.6	$1,151.6	$507.8	$681.7	$558.9
GROUNDFISH								
Number Active**	12	17	17	8	10	7	8	9
Landings	1,302.0	1,197.7	1,068.0	356.6	459.9	308.3	293.8	307.7
Revenues	$1,419.3	$1,248.4	$951.3	$379.0	$513.9	$350.5	$291.9	$305.2
Multispecies Revenues as a percent of Total Revenues	72.9%	60.8%	52.6%	33.0%	44.6%	69.0%	42.8%	54.6%

Table 602 - Fishing Activity for Vessels Homeported in Other New Hampshire
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.7.4 New Hampshire Summary

In New Hampshire, the total population increased to a greater extent than in Maine, with educational attainment rising and a small increase in poverty. The unemployment rate declined to below the national average in 2000. With a smaller coastline, New Hampshire reported fewer vessels and fewer fishing participants than other states. Fishing activity by groundfish vessels in Portsmouth, New Hampshire's primary port, was relatively stable throughout the 1990s. In other New Hampshire ports, groundfish dependence increased.

9.4.5.8 Massachusetts

This section summarizes available information about fishing communities in the state of Massachusetts and includes references to the appropriate documents, which are not included as part of this document.

Health care and the ability for the fishing industry to find and keep affordable health insurance is an important social issue. In November of 1996, Caritas Christi Health Care System and the Massachusetts Fishermen's Partnership funded the development of a report entitled, *Health Survey of the Fishing Population in Massachusetts*. The survey project in the state of Massachusetts was the beginning of a regional effort to determine the need for more affordable heath insurance for fishing families. It was initiated by leaders in the Massachusetts Fishermen's Partnership and provided information to support the much-needed Fishing Partnership Health Plan, which was initiated in 1997. A random sample of 3,500 permit holders in the state were selected for the survey, and 485 surveys were returned, providing information on 1,400 adults and children associated with the fishing industry in Massachusetts. The survey was conducted in the Spring and Summer of 1996, and based on the results, approximately 43% of the fish harvesting population in the state were without health insurance at that time. This Report can be referenced for additional important information about fishing families in many communities throughout Massachusetts, including information about employment, income, household characteristics, health insurance status, cost of health care, and other information related to the use of health services.

Demographic Profile of Massachusetts

MASSACHUSETTS	1990		2000		Percent change
Population (total individuals)	6,016,425		6,349,097		5.5%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	80.0%		84.8%		Difference = 4.8%
Poverty* (Number of families)	102,748		105,619		2.8%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	218,000	6.7%	150,952	4.6%	-30.8%

Table 603 - Population, education, poverty and unemployment statistics for the state of Massachusetts (1990 and 2000)

** data shown for 1989 and 1999*

Data source: U.S. Census Bureau

The total population in Massachusetts increased by 5.5% from 1990 to 2000 (Table 603). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 4.8% over the course of a decade, from 80% in 1990 to 84.8% in 2000. While the number of families below the poverty level increased slightly (2.8%), the unemployment rate declined, from 6.7% to 4.6% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
MASSACHUSETTS	6,349,097	6,203,092	5,367,286	343,454	15,015	238,124	2,489	236,724	146,005	428,729
COUNTY										
Barnstable County	**222,230**	**218,533**	**209,398**	**3,969**	**1,235**	**1,401**	**55**	**2,475**	**3,697**	**3,000**
Berkshire County	134,953	133,288	128,235	2,679	196	1,333	49	796	1,665	2,286
Bristol County	**534,678**	**522,166**	**486,434**	**10,856**	**1,308**	**6,728**	**145**	**16,695**	**12,512**	**19,242**
Dukes County	**14,987**	**14,509**	**13,592**	**359**	**256**	**69**	**11**	**222**	**478**	**155**
Essex County	**723,419**	**707,872**	**625,320**	**18,777**	**1,694**	**16,916**	**288**	**44,877**	**15,547**	**79,871**
Franklin County	71,535	70,380	68,244	637	205	741	19	534	1,155	1,425
Hampden County	456,228	445,623	360,889	36,935	1,201	5,918	313	40,367	10,605	69,197
Hampshire County	152,251	149,513	138,704	2,980	292	5,177	77	2,283	2,738	5,212
Middlesex County	**1,465,396**	**1,432,596**	**1,258,476**	**49,310**	**2,206**	**91,685**	**540**	**30,379**	**32,800**	**66,707**
Nantucket County	**9,520**	**9,370**	**8,363**	**789**	**1**	**61**	**4**	**152**	**150**	**212**
Norfolk County	**650,308**	**641,405**	**578,904**	**20,674**	**829**	**35,756**	**160**	**5,082**	**8,903**	**11,990**
Plymouth County	**472,822**	**460,895**	**419,370**	**21,573**	**1,007**	**4,352**	**110**	**14,483**	**11,927**	**11,537**
Suffolk County	**689,807**	**659,619**	**398,442**	**153,418**	**2,689**	**48,287**	**441**	**56,342**	**30,188**	**107,031**
Worcester County	750,963	737,323	672,915	20,498	1,896	19,700	277	22,037	13,640	50,864

Table 604 - Population by race in Massachusetts counties, 2000

Counties examined in Fishing Communities section of AHE in bold type.

Data source: U.S. Census Bureau

Massachusetts has a much larger total population than both Maine and New Hampshire. The population of Massachusetts is 84.5% white, with 5.4% black/African American, 3.8% Asian, 2.3% of two or more races, and just under 4% represented by all other races combined (Table 604). 6.8% of the population is Hispanic/Latino of any race. The population in Essex County (Gloucester and North Shore) is 86.4% white, 2.6% black/African American, 2.3% Asian, 2.1% of two or more races, under 1% Indian and Hawaiian/Pacific Islander, and 6.2% of other races. Essex County has the third highest percentage of Hispanic/Latino of any race, at 11% of the total county population. Boston and the South Shore port group is composed of Middlesex, Suffolk, Norfolk and Plymouth counties, which are among the Massachusetts counties with the largest total populations. Boston is in Suffolk County, which has the highest percentage of non-whites (42.2%) of any of the counties in Massachusetts. The population is 22.2% black/African American, 7% Asian, 4.4% of two or more races, and 8-9% all other races. Suffolk has the highest percentage of Hispanic/Latino of any race, at 15.5% of the total population. The total populations of Middlesex, Norfolk, and Plymouth counties are between 86% and 89% white, 3.2-4.6% black/African American, 1-6% Asian, 1.4-2.5% of two or more races, and 1-3% of all other races. Barnstable, Dukes and Nantucket counties make up the Cape and Islands port group. The populations of Barnstable and Dukes are over 90% white, with approximately 2% black/African American, 1.7-3.2% of two or more races, and 2-4% all other races combined. Nantucket is 87.8% white, 8.3% black/African American, and below 2% of each of the other races. The New Bedford Coast port group is in Bristol County, which is also predominantly white.

9.4.5.8.1 Gloucester and the North Shore

Gloucester and other North Shore communities discussed in this document are located in Essex County.

Essex County	1990		2000		Percent change
Population (total individuals)	670,080		723,419		8.0%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	80.2%		84.6%		Difference = 4.4%
Poverty* (Number of families)	13,193		12,233		-7.3%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	24,625	6.9%	16,880	4.6%	-31.5%

Table 605 - Population, education, poverty and unemployment statistics for Essex County, MA (1990 and 2000)

** data shown for 1989 and 1999*

Data source: U.S. Census Bureau

The total population in Essex County increased 8.0% between 1990 and 2000 (Table 605). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 80.2% in 1990 to 84.6% in 2000, a rise of 4.4 percentage points over the period. The number of families living in poverty decreased about 7%, and the number of unemployed decreased 31.5% from 1990 to 2000. The unemployment rate declined from 6.9% of the labor force in 1990 to 4.6% in 2001.

Fishing Industry Employment in Gloucester and the North Shore

Essex County

The number of reported fishing establishments increased 5.4% from 816 in 1997 to 860 in 1998, and declined 7% between 1998 and 2000 (Table 606). The average payroll for individuals in the fishing sector was $48,395 in 2000. The number of establishments in the seafood product preparation and packaging, fresh and frozen seafood processing, and fish and seafood markets sectors increased from 1998 to 2001. The number of seafood canning establishments remained small but stable after 1998, with two reported establishments in each year. Fish and seafood wholesale reported the greatest number of establishments after the fishing sector, and was the only other sector besides fishing to report a decline in numbers (66 in 1998 to 47 in 2001).

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	816	860	842	800	NA
	Sum of Annual payroll	28,152	30,492	35,728	38,716	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	9	12	13	13
	Sum of Annual payroll	NA	43,062	45,861	41,685	44,614
311711** Seafood canning	Sum of Total Establishments	NA	1	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	8	10	11	11
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	66	57	51	47
	Sum of Annual payroll	NA	17,822	18,638	16,288	15,660
44522** Fish and seafood markets	Sum of Total Establishments	NA	15	15	17	19
	Sum of Annual payroll	NA	1,437	1,370	1,235	1,280

Table 606 - Employment in fishing and related industries in Essex County, MA (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.8.1.1 Gloucester, MA

Gloucester, Massachusetts has been identified as a primary multispecies port.

MARFIN – The MARFIN Report provides a detailed profile of Gloucester. It also includes a general profile of the North Shore sub-region and Essex County, the county in which Gloucester and the North Shore communities are located. These profiles should be referenced for social and demographic data not contained in this document.

Gloucester has been a fishing port since it was founded in 1623. One individual told MARFIN researchers, "everyone in Gloucester knows a fisherman." It is a tight community where fishing is still an honorable profession. It was mentioned in the MARFIN Report that Gloucester is probably diversified enough to sustain itself without fishing, but it is hard to imagine a city like Gloucester without commercial fishing.

Gloucester's inner harbor is a "designated port area," thus legally bound to maintaining marine dependent uses.

The 1990 Census reported that 28,716 individuals lived in Gloucester, and in 1996, that number increased to 29,267. In 1997, there were 226 federally-permitted vessels in Gloucester. One respondent from the MARFIN Report estimated that 90% of the fleet was born in the Gloucester area, and sixty percent of those individuals have fishing in their family history. Gloucester is the original home of frozen fish thanks to Gloucester native, Clarence Birdseye, who developed the technique of freezing fish. Today, Gloucester is still the leader in processing frozen fish, but most of the fish is imported from Canada, Iceland, and Norway. Gloucester has a large infrastructure for commercial fishing including dealers, trucking companies, the Gloucester Display Auction, and several fuel companies. In 1997, it was estimated that there were 1,581 employees earning $58 million in the seafood processing and wholesaling industry in Gloucester.

Most fishermen in Gloucester are full-time, but due to fishery regulations many have supplemented their income with other land-based jobs such as mechanics or construction workers. The MARFIN Report found that most fishermen from Gloucester are full-time groundfish fishermen or lobstermen. There are numerous fishing-related organizations in Gloucester, and many of them have been active in the regional fisheries management process. The communication between the fishing industry and government representatives is said to be "strong" in Gloucester. The presence of recreational fishing is growing, and whale watching is another active industry in this port.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Gloucester, Massachusetts on November 1, 2000, and many residents from Gloucester and surrounding communities attended and submitted comments. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of Gloucester relate to impacts on children and the younger generation in the community from stress, uncertainty, and changes in the family structure as well as safety issues associated with adaptations that fishermen are making in response to decreased fishing opportunities (less crew, less maintenance, more risk-taking). The groundfish regulations that Gloucester residents feel have produced the most significant social impacts in this community are the Gulf of Maine area closures, both year-round and seasonal. Please see the complete meeting report for additional discussion of these and other important social impact issues.

Additional Community Information – Gloucester's fishing industry is supported by a seafood display auction. In August of 2000, Council staff had the opportunity to interview the general manager of the Gloucester Seafood Display Auction. The bullets below summarize some interesting information about activity at the auction (from August 2000 Council staff interview with general manager of the auction):

- The Gloucester Display Auction (GDA) opened its doors in December of 1997. The GDA was founded partially as a response to increasing regulations and partially as a business venture to increase marketing opportunities for local vessels. The GDA facility is about 40,000 square feet.
- Over the course of a year, the GDA services more than 300 vessels. Most of the vessels are local (from Gloucester and surrounding areas), although there is some crossover with vessels from ME, and there is an offshore vessel fleet from Rhode Island that offloads at the auction seasonally.
- Currently, the GDA employs 15-20 people year-round, and an additional 20-30 people seasonally, totaling about 40-50 people on an annual basis. This should increase as the auction continues to expand its capabilities.
- In general, the GDA is heavily dependent on groundfish. Primary species on the auction floor include haddock, cod, pollock, and hake. The GDA doesn't handle as much monkfish and flatfish as the Portland Fish Exchange.

- Cod regulations have impacted business at the GDA greatly because there are fewer boats dayfishing. In order to make a trip, vessels have been "fishing through cod" to catch enough flatfish. The result has been a lower quality flatfish product.
- The general manager also discussed the notion that the rolling closures put too much pressure on one area that is open at a time (inshore areas). The rolling closures have resulted in shifts of effort and concentrations of effort that have devastated the price of some species. Effort becomes concentrated in small areas, and the vessels all pound an area, pound the bottom, decrease the quality of the product, and flood the market with too much product. Processors, facing decreased local product and uncertainty about the future, have contracted for international products and are in the frozen H&G market now. Frozen product has a set price and consistent supply. Processors cannot stop their operations to take fresh product when there is a glut and hope that they can process it quickly enough before it spoils. In turn, the price for locally-caught fresh fish has plummeted.

In 1999, the City of Gloucester published a Harbor Plan designed to rejuvenate Gloucester's waterfront and maintain the social and cultural infrastructure to allow this port community to continue to grow and evolve to meet the needs of its residents. The 1999 Gloucester Harbor Plan, developed by an 18 member Committee representing harbor user groups and citizens, was accepted by the Mayor and the City Council in March 1999 and approved by the Massachusetts Secretary of Environmental Affairs on July 6, 1999. The Plan includes a three-pronged strategy to meet the community's goals:

1. Rebuild Harbor Infrastructure
2. Strengthen the Traditional Port
3. Celebrate Historical and Cultural Assets

Copies of the Gloucester Harbor Plan are available through the City of Gloucester as well as the Gloucester Fisheries Commission. This Plan should be referenced for additional information about the community of Gloucester as well as to emphasize the importance of fishing and fishing-related businesses to the city.

Fishing Activity in Gloucester, MA

By Port of Landing

The number of active permitted multispecies vessels decreased 18% from 350 in 1994 to 286 in 1995, and increased to 321 in 1998 (Table 607). Since 1998, this number generally declined, reaching 301 in 2001. The number of multispecies vessels landing groundfish decreased from 1994 to 1996, generally increasing afterwards. While the total number of vessels reporting groundfish landings remained relatively stable over the time period, this number increased as a proportion of the total number of vessels reporting landings of any species, from 75% in 1994 to 87% in 2001. Total landings in Gloucester doubled from 1994 to 1998, declined 63% from 1998 to 1999, and remained stable from 1999 to 2000, more than doubling in the following year. Revenues remained relatively stable from 1994 to 2001. Groundfish landings declined about 17% from 1994 to 1995, then increased from 1995 to 2001. Revenues followed a similar trend except from 1999 to 2000, when revenues decreased while landings increased. Small mesh non-multispecies composed the majority of total landings, increasing four-fold from 1994 to 1998, followed by a decline through 2000. Landings of small mesh multispecies, high value species and other species generally declined throughout the time period. Groundfish comprised the second greatest proportion of total landings across the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	350	286	297	292	321	280	314	301
Number of Multispecies Vessels Landing Groundfish	264	229	192	197	221	216	279	261
TOTAL								
Landings	46,527.2	53,708.7	70,756.1	76,162.2	105,586.1	39,059.1	38,977.4	86,153.3
Revenues	$27,319.7	$22,472.0	$21,387.9	$22,852.7	$25,767.5	$24,919.5	$25,816.4	$28,309.8
GROUNDFISH								
Landings	14,371.7	11,870.7	12,003.7	12,468.6	12,950.4	13,017.1	14,303.0	17,061.1
Revenues	$17,242.6	$13,592.6	$11,976.3	$13,385.7	$14,882.6	$15,875.4	$15,445.8	$17,025.9
SMALL MESH MULTISPECIES								
Landings	3,370.4	2,872.1	2,604.9	2,104.5	2,072.7	2,914.3	2,508.8	1,141.3
Revenues	$1,213.1	$1,029.8	$771.4	$823.4	$972.9	$1,570.0	$1,120.7	$604.7
SMALL MESH NON-MULTISPECIES								
Landings	19,031.9	28,403.9	47,048.2	51,326.3	77,945.0	15,176.1	14,853.3	61,655.5
Revenues	$1,738.3	$1,998.3	$2,639.4	$2,854.1	$4,318.2	$882.4	$840.5	$3,350.8
OTHER SPECIES								
Landings	9,434.5	10,374.3	8,632.4	9,917.1	12,316.3	7,651.5	6,953.7	5,802.8
Revenues	$4,779.0	$4,399.6	$3,139.2	$2,986.5	$3,665.1	$4,680.2	$6,624.0	$5,331.7
HIGH VALUE SPECIES								
Landings	318.8	187.7	466.9	345.7	301.7	300.1	358.6	492.6
Revenues	$2,346.8	$1,451.7	$2,861.7	$2,802.9	$1,928.7	$1,911.4	$1,785.4	$1,996.6

Table 607 - Landings and Revenues from Multispecies Permit Holders in Gloucester, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels homeported in Gloucester remained relatively stable from 1994 to 2001, with some decline through the late-1990s (Table 608). The numbers of active vessels landing any species and those landing groundfish declined approximately 14% and 10%, respectively during this time period. Total landings and revenues generally increased from 1994 to 1998 then dropped in subsequent years. 2001 landings were 58% lower than landings reported in 1994. Groundfish landings remained relatively stable across the time period, fluctuated around a mean of 10 million pounds from 1994 to 2000 and increasing 23.6% from 2000 to 2001. Groundfish dependence remained stable from 1994 to 2000, averaging 63% each year, and increased to 71.4% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	279	285	269	253	231	244	249	272
TOTAL								
Number Active*	184	172	163	156	145	143	151	159
Landings	28,093.8	35,750.7	33,264.4	40,444.1	50,417.0	29,739.6	16,833.9	17,758.5
Revenues	$20,215.0	$18,537.7	$16,602.8	$16,858.8	$17,174.3	$20,447.4	$18,335.9	$18,625.4
GROUNDFISH								
Number Active**	165	151	131	129	124	127	143	149
Landings	10,669.1	9,590.7	10,381.1	10,334.0	9,007.7	9,945.9	10,470.6	12,937.0
Revenues	$12,953.0	$11,489.5	$10,560.1	$10,921.9	$10,876.3	$12,376.7	$11,496.6	$13,294.9
Multispecies Revenues as a percent of Total Revenues	64.1%	62.0%	63.6%	64.8%	63.3%	60.5%	62.7%	71.4%

Table 608 - Fishing Activity for Vessels Homeported in Gloucester, MA
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.1.2 The North Shore of Massachusetts

The North Shore of Massachusetts is a secondary multispecies port group that includes Rockport, Newburyport, Beverly, Salem, Marblehead, Manchester, and Swampscott. These communities are located in Essex County.

MARFIN – The MARFIN Report provides detailed profiles of Rockport and Marblehead, Massachusetts. It also includes a general profile of the Gloucester/North Shore sub-region and Essex County, the county in which the North Shore communities are located. These profiles should be referenced for social and demographic data not contained in this document.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Gloucester, MA on November 1, 2000. A few residents from North Shore communities attended and submitted comments. While attendance from these communities was not overwhelming, the information collected at these two social impact meetings may reflect, at least in part, the perspectives of the residents of these communities, especially because some of these communities are very closely connected to Gloucester. The summary from these meetings can be found in Appendix I.

Fishing Activity on the North Shore

By Port of Landing
The number of active multispecies vessels and those reporting landings of groundfish on the North Shore increased from 1994 to 2001 (Table 609). By 2000, 100% of the active multispecies vessels were reporting groundfish landings. Total and groundfish landings increased from 1994 to 1995, declined 1995 to 1999, and increased in the last two years of the time period. Small mesh non-multispecies landings demonstrated a steep decline from 1994 to 2001, while small mesh multispecies landings fluctuated during this period. Groundfish landings increased nearly 46% from 1994 to 2001, and made up the greatest percentage of total landings in all years.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	52	69	48	52	50	48	60	77
Number of Multispecies Vessels Landing Groundfish	45	64	42	43	46	44	60	76
TOTAL								
Landings	1,445.4	2,159.6	2,024.9	1,507.4	1,315.6	1,099.6	1,352.0	1,603.6
Revenues	$1,512.4	$2,359.5	$1,762.3	$1,359.3	$1,133.8	$994.7	$1,316.0	$1,660.4
GROUNDFISH								
Landings	964.4	1,413.6	1,062.9	818.0	699.6	581.5	1,103.7	1,406.7
Revenues	$1,104.3	$1,694.8	$1,079.2	$969.6	$881.6	$711.4	$1,085.9	$1,437.4
SMALL MESH MULTISPECIES								
Landings	17.1	14.4	32.7	13.9	16.4	33.3	29.3	10.7
Revenues	$8.3	$7.1	$9.8	$4.7	$6.0	$13.4	$11.5	$3.6
SMALL MESH NON-MULTISPECIES								
Landings	341.5	414.1	349.9	230.9	145.8	147.6	69.3	10.7
Revenues	$315.3	$322.1	$280.5	$200.5	$86.4	$100.2	$49.3	$9.4
OTHER SPECIES								
Landings	119.6	312.8	560.3	438.9	450.3	331.2	145.5	157.2
Revenues	$74.2	$318.6	$254.4	$143.4	$145.8	$145.9	$153.9	$137.4
HIGH VALUE SPECIES								
Landings	2.9	4.7	19.1	5.8	3.5	6.0	4.2	18.2
Revenues	$10.4	$16.9	$138.4	$41.1	$14.0	$23.8	$15.4	$72.5

Table 609 - Landings and Revenues from Multispecies Permit Holders in the North Shore Group (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels declined from 1994 to 1999 and increased in the following two years (Table 610). Total active and those reporting groundfish declined throughout the time period. Total landings by vessels homeported on the North Shore declined steadily, with an average decrease of 4.5% each year. Revenues followed a similar trend. Groundfish landings declined from 1994 to 1999, demonstrating a substantial increase from 2000 to 2001. The groundfish landings in 2001 were 15% lower than those reported in 1994. Dependence on groundfish changed little throughout the time period, averaging 56.8% each year.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	195	187	160	144	134	132	144	161
TOTAL								
Number Active*	87	76	65	57	69	52	50	56
Landings	4,934.8	5,665.9	4,516.0	3,903.4	3,452.6	2,280.2	2,085.1	2,951.5
Revenues	$4,997.1	$5,237.2	$3,768.4	$2,602.7	$2,032.8	$1,808.1	$2,117.1	$3,100.4
GROUNDFISH								
Number Active**	61	58	55	44	52	42	45	53
Landings	2,294.8	2,358.4	1,798.8	1,447.7	1,208.1	860.1	1,366.2	1,991.7
Revenues	$2,761.3	$2,799.9	$1,793.5	$1,680.5	$1,140.7	$953.9	$1,347.3	$1,890.7
Multispecies Revenues as a percent of Total Revenues	55.3%	53.5%	47.6%	64.6%	56.1%	52.8%	63.6%	61.0%

Table 610 - Fishing Activity for Vessels Homeported in the North Shore Group
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.2 Boston and the South Shore

Boston and other south shore communities discussed in this document are located in Middlesex, Suffolk, Norfolk, and Plymouth counties.

Middlesex County	1990		2000		Percent change
Population (total individuals)	1,398,468		1,465,396		4.8%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	84.3%		88.5%		Difference = 4.2%
Poverty* (Number of families)	14,831		15,740		6.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	46,588	5.8%	27,660	3.4%	-40.6%

Table 611 - Population, education, poverty and unemployment statistics for Middlesex County, MA (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Middlesex County increased 4.8% between 1990 and 2000 (Table 611). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 84.3% in 1990 to 88.5% in 2000, a rise of 4.2 percentage points over the period. While the number of families living in poverty increased about 6%, the number of unemployed decreased 40.6% from 1990 to 2000. The unemployment rate declined from 5.8% of the labor force in 1990 to 3.4% in 2001.

Suffolk County	1990		2000		Percent change
Population (total individuals)	663,906		689,807		3.9%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	75.4%		78.1%		Difference = 2.7%
Poverty* (Number of families)	20,223		21,033		4.0%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	30,099	8.3%	25,017	7.1%	-16.9%

Table 612 - Population, education, poverty and unemployment statistics for Suffolk County, MA (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Suffolk County, which includes the city of Boston, is the most urban county in this community group. The total population in Suffolk County increased 3.9% between 1990 and 2000 (Table 612). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 75.4% in 1990 to 78.1% in 2000, a rise of 2.7 percentage points over the period. While the number of families living in poverty increased 4%, the number of unemployed decreased nearly 17% from 1990 to 2000. The unemployment rate declined from 8.3% of the labor force in 1990 to 7.1% in 2001. The unemployment rate in Suffolk County is nearly double the rate in Norfolk, Middlesex and Plymouth counties. Educational attainment is also lower than that in other counties on the south shore.

Norfolk County	1990		2000		Percent change
Population (total individuals)	616,087		650,308		5.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	88.0%		91.3%		Difference = 3.3%
Poverty* (Number of families)	4,919		4,824		-1.9%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	19,235	5.5%	11,028	3.2%	-42.7%

Table 613 - Population, education, poverty and unemployment statistics for Norfolk County, MA (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Norfolk County increased 5.6% between 1990 and 2000 (Table 613). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 88% in 1990 to 91.3% in 2000, a rise of 3.3 percentage points over the period. The number of families living in poverty decreased about 2%, and the number of unemployed decreased 42.7% from 1990 to 2000. The unemployment rate declined from 5.5% of the labor force in 1990 to 3.2% in 2001.

Plymouth County	1990		2000		Percent change
Population (total individuals)	435,276		472,822		8.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	83.8%		87.6%		Difference = 3.8%
Poverty* (Number of families)	5,958		6,083		2.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	16,550	7.1%	10,095	4.1%	-39.0%

Table 614 - Population, education, poverty and unemployment statistics for Plymouth County, MA (1990 and 2000)

** data shown for 1989 and 1999*

Data source: U.S. Census Bureau

The total population in Plymouth County increased 8.6% between 1990 and 2000 (Table 614). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 83.8% in 1990 to 87.6% in 2000, a rise of 3.8 percentage points over the period. While the number of families living in poverty increased about 2%, and the number of unemployed decreased 39% from 1990 to 2000. The unemployment rate declined from 7.1% of the labor force in 1990 to 4.1% in 2001.

Fishing Industry Employment in Boston and the South Shore

Middlesex County

The number employed in the fishing sector was reported at 84 in 1999, but could not be reported in other years from 1997 to 2000 due to confidentiality reasons (Table 615). The fish and seafood wholesale had the greatest number of establishments after fishing, with an average of 17 in each year from 1998 to 2001. Between 14 and 15 fish and seafood markets were reported each year from 1998 to 2001, increasing to 18 in 2001. Seafood product preparation and packaging and fresh and frozen seafood processing sectors reported 1-2 establishments each year, remaining stable throughout the time period. There were no seafood canning establishments reported in Middlesex County.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	D	D	84	D	NA
	Sum of Annual payroll	D	D	2,369	D	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	2	1	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	2	2	1	2
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	16	18	17	18
	Sum of Annual payroll	NA	3,379	5,457	5,924	5,841
44522** Fish and seafood markets	Sum of Total Establishments	NA	14	15	14	18
	Sum of Annual payroll	NA	690	675	625	777

Table 615 - Employment in fishing and related industries in Middlesex County, MA (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Suffolk County

The number of individuals employed in fishing increased from 80 in 1997 to 88 in 1998 and remained stable through 2000 (Table 616). The average payroll for fishing sector establishments was $60,375 in 2000. Between 44 and 49 establishments were reported in the fish and seafood wholesale sector in 2000. With around ten establishments in each year from 1998 to 2001, the seafood product preparation and packaging and fresh and frozen seafood processing sectors remained stable throughout the time period. Fish and seafood markets numbered, on average, 12 each year. No establishments were reported in the seafood canning sector.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	80	88	89	88	NA
	Sum of Annual payroll	3,238	3,801	3,928	5,313	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	10	10	10	9
	Sum of Annual payroll	NA	11,382	11,672	11,967	13,888
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	10	10	10	9
	Sum of Annual payroll	NA	11,382	11,672	11,967	13,888
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	46	49	48	44
	Sum of Annual payroll	NA	32,936	36,681	38,531	41,580
44522** Fish and seafood markets	Sum of Total Establishments	NA	13	11	11	13
	Sum of Annual payroll	NA	439	468	724	861

Table 616 - Employment in fishing and related industries in Suffolk County, MA (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Norfolk County

The fishing sector reported 141 establishments in 1997 and 1998, increasing to 158 in 1999, and declining to 149 in 2000 (Table 617). The average annual payroll was $43,691 for individuals in this sector. The fish and seafood wholesale sector reported 8-9 establishments each year from 1998 to 2001, and the fish and seafood markets sector reported 6-7 during this period. Other sectors were reported in low numbers.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	141	141	158	149	NA
	Sum of Annual payroll	5,329	4,738	6,426	6,510	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	0	0	0
	Sum of Annual payroll	NA	E	0	0	0
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	9	8	8	8
	Sum of Annual payroll	NA	2,993	3,284	3,411	3,629
44522** Fish and seafood markets	Sum of Total Establishments	NA	7	7	7	6
	Sum of Annual payroll	NA	451	394	349	242

Table 617 - Employment in fishing and related industries in Norfolk County, MA (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*

*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*

NAICS = North American Industry Classification System

***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*

***E** =reported as zero, may be in error or <$1,000*

***NA** = not applicable*

Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Plymouth County

Total fishing establishments increased over 13% from 502 in 1997 to 569 in 1999, followed by a decrease to 531 in 2000 (Table 618). The average payroll during 2000 for individuals in this sector was $48,339. After 1998, the fish and seafood markets sector remained stable, reporting 13 establishments in each year. The number of establishments in the fish and seafood wholesale sector averaged 20 per year across the period. Other sectors remained small but stable from 1998 to 2001.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	502	551	569	531	NA
	Sum of Annual payroll	19,796	20,503	24,738	25,668	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	3	3	2	3
	Sum of Annual payroll	NA	E	E	E	1,185
311711** Seafood canning	Sum of Total Establishments	NA	1	2	1	1
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	2	1	1	2
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	21	21	18	20
	Sum of Annual payroll	NA	3,519	4,085	5,010	5,597
44522** Fish and seafood markets	Sum of Total Establishments	NA	10	13	13	13
	Sum of Annual payroll	NA	626	607	613	823

Table 618 - Employment in fishing and related industries in Plymouth County, MA (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.8.2.1 Boston, MA

Boston, Massachusetts has been identified as a primary multispecies port. It is located in Suffolk County.

MARFIN – The MARFIN Report provides a detailed profile of Boston, Massachusetts. This profile should be referenced for social and demographic data not contained in this document.

Boston has historically been a harbor dominated by maritime industries such as fishing, shipbuilding, trade, and commerce. Although Boston is no longer considered a fishing-dependent community with high annual landings, it still provides numerous support services for smaller ports all over New England. MARFIN categorizes Boston as an essential provider to the regional industry. Today, Boston is the major center of international transshipment of fishing products from all over New England. Boston has a container cargo port, rail accesses, major highways and an international airport. MARFIN notes that while the number of processors and fish harvesters have declined, fishing has remained a critical component of Boston's economy. It is interesting to note that the Boston Auction used to handle about one million pounds of fish each day; today, the average is 50,000 pounds each day. Respondents explained to MARFIN that due to the regulations that require vessels to take their nets apart when transiting the closed areas, fishermen decided to land in outlying ports instead of Boston.

MARFIN concluded that Boston specializes in fresh fish production and wholesale marketing, which employs roughly 1,063 individuals earning $40 million in 1997. The workforce in the fishing industry in Boston is rather diverse; some processor employees are first-generation immigrants from regions like Guatemala and Mexico, lobstermen are predominantly English, Irish, and Scottish, and draggers are primarily Polish or Italian-Americans. MARFIN found that there are about 12 draggers left in the port of Boston and 20-30 lobster boats, together employing about 100 fishermen. The average income per fishermen in 1997 was $23,000. The majority of vessels were found to be owner-operated. MARFIN received feedback that recreational sailing seems to be more prominent in this harbor than recreational fishing.

Social Impact Informational Meetings – Council staff conducted an impromptu social impact informational meeting in Boston, Massachusetts on December 4, 2000, and many residents from Boston and surrounding communities attended and submitted comments. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of Boston relate to employment stability, the loss of year-round fishing opportunities, and concerns about safety as fishermen adapt to regulations by trying to maximize their available DAS and fish farther from shore and in more extreme weather. The groundfish regulations that Boston residents feel have produced the most significant social impacts in this community are the Amendment 5/7 DAS allocations and reductions. Many vessels in Boston have Individual DAS permits, and meeting participants noted the loss of opportunity and flexibility that resulted from the 50% reduction in Individual DAS. Please see the complete meeting report for additional discussion of these and other important social impact issues.

Fishing Activity in Boston, MA

By Home Port State

The number of active permitted multispecies vessels peaked in 1997 at 92 vessels, with an overall decline across the time period from 77 vessels in 1994 to 39 vessels in 2001 (Table 619). Those landing groundfish also declined in number, from 76 vessels in 1994 to 35 vessels in 2001. The percentage of active multispecies vessels reporting landings of groundfish remained high throughout the time period, ranging from 76-100% of the total active vessels. Total landings in Boston declined gradually across the time period, except for a 57.6% increase from 2000 to 2001. Revenues declined constantly from 1994 to 2001. Groundfish landings and revenues declined as well, the 1994 landings nearly twice that in 2001. Groundfish made up the greatest proportion of the total landings during the time period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	77	76	71	92	60	30	28	39
Number of Multispecies Vessels Landing Groundfish	76	58	60	71	57	30	25	35
TOTAL								
Landings	8,098.4	8,009.1	7,960.4	8,172.5	6,074.7	5,843.1	4,959.8	7,817.9
Revenues	$10,832.4	$10,602.2	$10,202.1	$10,612.4	$8,613.2	$8,537.9	$6,827.4	$6,155.0
GROUNDFISH								
Landings	5,690.0	5,877.3	6,400.9	6,363.8	4,909.7	4,237.5	3,744.5	4,196.5
Revenues	$7,816.0	$7,839.2	$8,018.8	$7,896.3	$6,976.8	$5,864.8	$4,470.7	$4,236.6
SMALL MESH MULTISPECIES								
Landings	2.5	1.8	4.6	5.6	3.9	1.7	7.2	2.2
Revenues	$1.2	$0.5	$3.1	$3.7	$1.7	$1.1	$8.2	$2.1
SMALL MESH NON-MULTISPECIES								
Landings	0.1	4.3	2.6	51.8	21.3	C	0.0	C
Revenues	$0.2	$2.8	$2.0	$41.7	$10.5	C	$0.0	C
OTHER SPECIES								
Landings	2,288.3	1,991.0	1,422.8	1,599.5	1,067.5	1,553.9	1,162.0	1,340.5
Revenues	$2,558.5	$2,158.4	$1,595.7	$1,958.0	$1,292.4	$2,445.4	$2,147.9	$1,322.0
HIGH VALUE SPECIES								
Landings	117.4	134.7	129.5	151.9	72.3	50.0	46.1	87.6
Revenues	$456.4	$601.3	$582.5	$712.7	$331.8	$226.5	$200.5	$290.1

Table 619 - Landings and Revenues from Multispecies Permit Holders in Boston, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

The number of permitted multispecies vessels, active vessels, and those reporting landings of groundfish declined from 1994 to 2001 (Table 620). Total landings remained relatively stable, except for a peak in 1997 at 8 million pounds. Overall, total landings exhibit a slight positive trend. Groundfish landings rose from 1994 to 1997, declined 1997 to 1999, increasing afterwards. Dependence on groundfish did not change dramatically, averaging 62.4% per year.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	67	70	62	51	42	33	32	38
TOTAL								
Number Active*	32	37	34	33	27	20	18	19
Landings	5,029.8	5,859.5	6,793.1	8,047.4	5,589.4	4,939.3	5,332.4	5,672.5
Revenues	$6,693.6	$7,473.6	$7,984.4	$9,067.8	$7,043.4	$7,923.8	$7,625.1	$6,488.3
GROUNDFISH								
Number Active**	27	30	29	27	24	19	18	18
Landings	3,296.2	3,478.5	4,019.9	4,407.5	3,612.8	3,043.5	3,633.5	3,910.5
Revenues	$4,467.1	$4,771.6	$5,109.8	$5,493.8	$4,890.7	$4,296.4	$4,401.2	$4,083.5
Multispecies Revenues as a percent of Total Revenues	66.7%	63.8%	64.0%	60.6%	69.4%	54.2%	57.7%	62.9%

Table 620 - Fishing Activity for Vessels Homeported in Boston, MA
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.2.2 The South Shore of Massachusetts

The South Shore of Massachusetts is a secondary multispecies port group that includes Scituate, Plymouth, and Marshfield (Green Harbor). These communities are located in Middlesex, Norfolk and Plymouth counties.

MARFIN – The MARFIN Report provides detailed profiles of Plymouth and Scituate, Massachusetts. It also includes a general profile of Plymouth County, the county in which the South Shore communities are located. These profiles should be referenced for social and demographic data not contained in this document.

The Pilgrims landed in Plymouth in 1620, and it became the first permanent settlement in New England. Plymouth is about five miles north of the Cape Cod Canal and attracts thousands of tourists each summer; however, the area still maintains a diverse commercial fishery. Scituate is a small to mid-sized community located equidistant from Boston and Plymouth. There are two piers in Plymouth, one reserved for the Mayflower, and the other reserved for commercial use. The local community has agreed to protect 15% of total dockage space for the commercial fleet, while recreational boats use the remaining 85%. Fishery dependence in Plymouth is based on the lobster industry. MARFIN found that there are 50 lobster vessels in Plymouth as well as four stern draggers and four gillnetters. Four stern draggers is a significant decline from 30 or so draggers that used to harvest dogfish in Plymouth just five years ago. Key respondents in the MARFIN report estimated that there are 200 households directly dependent on fishing in Plymouth, and another 50-100 indirectly dependent. The majority of fishermen from this area were born to fishing families, but fewer children seem to be getting into the industry. There are limited fish dealers and support services in Plymouth. There are substantial businesses that support the recreational sector including five boat yards, marinas and hotels.

Scituate used to have many commercial boats in its harbor, but today there are only four mid-sized trawlers, five gillnet vessels, and about 50 lobster boats. MARFIN determined that before the groundfish regulations, there were 15-18 draggers that now go lobstering instead. Seventy-five to one hundred vessels were homeported in Marshfield, and fifteen of them were charter boats. Dogfish used to be a major species for Marshfield vessels, but recent regulations have eliminated that fishery. Similar to Plymouth, there are no processing facilities in Scituate, and little infrastructure to support the commercial fishing industry. Marshfield on the other hand, is a center for tuna landings, with infrastructure for processing and transporting tuna to Logan Airport in Boston. MARFIN reported that about 300 fishermen live in the Scituate/Marshfield area, and another 100 households are indirectly dependent on commercial fishing.

Respondents in Scituate told MARFIN researchers that the economic condition of the fishing industry was "excellent" ten years ago. "Everyone had the freedom to fish and some chose to take the pressure of groundfish" and went after dogfish. Today, fishermen from this believe the closures in blocks 124 and 125 put Scituate boats at a disadvantage. MARFIN reports that a lot of boats have gone out of business and some have switched from finfishing to lobstering.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Scituate, Massachusetts on December 4, 2000, and many residents from Scituate, Plymouth and surrounding South Shore communities attended and submitted comments. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of South Shore communities relate to stress and loss of morale resulting from regulatory discarding and uncertainty, employment stability, and conflicts resulting from perceived inequities in the regulations (big boat/small boat, commercial/recreational). The groundfish regulations that South Shore residents feel have produced the most significant social impacts in this community are the Gulf of Maine rolling closures. These closures were cited for eliminating year-round fishing opportunities, reducing flexibility, and compromising safety as small vessels adapt by fishing with less crew and/or farther from shore. Please see the complete meeting report for additional discussion of these and other important social impact issues.

Fishing Activity on the South Shore

By Port of Landing

The number of vessels landing fish in south shore ports increased almost 28% from 1994 to 1995, generally declining afterwards to 70 vessels in 2001 (Table 621). The number of vessels landing groundfish remained more stable, with a dip in 1997 to 58 vessels, averaging 73 in all other years. Total landings nearly doubled from 1994 to 1995, remained stable in the following year, and declined 74% from 1996 to 2001. This trend was driven by landings of Other Species, which made up the greatest proportion of total landings in most years. Groundfish landings increased, with an average annual increase of 11.8%. Small mesh multispecies landings fluctuated throughout the time period, while small mesh non-multispecies remained low throughout the period, with a peak of 128,000 pounds in 1998. High value species landings were low and relatively consistent until 2000, when landings increased 441% from the previous year.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	79	101	95	83	96	81	83	70
Number of Multispecies Vessels Landing Groundfish	71	79	77	58	79	69	70	65
TOTAL								
Landings	5,117.1	10,008.5	10,175.6	7,064.5	5,632.6	3,057.4	3,077.1	2,677.0
Revenues	$2,171.9	$2,792.6	$3,008.2	$2,416.4	$2,990.2	$2,373.9	$3,259.5	$2,653.4
GROUNDFISH								
Landings	1,006.6	682.6	863.3	911.7	1,284.6	1,251.5	1,741.5	1,830.8
Revenues	$1,271.4	$828.8	$1,213.4	$1,406.8	$1,588.5	$1,512.9	$1,736.0	$1,696.6
SMALL MESH MULTISPECIES								
Landings	2.9	40.4	36.6	12.1	45.3	2.7	2.4	1.9
Revenues	$1.2	$13.6	$14.4	$3.6	$11.3	$1.1	$0.8	$0.7
SMALL MESH NON-MULTISPECIES								
Landings	3.4	5.8	36.4	4.4	128.3	3.6	7.1	1.1
Revenues	$2.2	$3.4	$14.3	$1.9	$98.5	$2.0	$3.7	$0.5
OTHER SPECIES								
Landings	4,094.9	9,270.9	9,231.0	6,129.6	4,161.1	1,793.8	1,294.3	767.8
Revenues	$866.1	$1,906.7	$1,714.8	$960.3	$1,225.2	$821.7	$1,393.1	$734.6
HIGH VALUE SPECIES								
Landings	9.3	8.9	8.3	6.6	13.3	5.9	31.8	75.4
Revenues	$31.0	$40.1	$51.3	$43.8	$66.7	$36.2	$126.0	$221.0

Table 621 - Landings and Revenues from Multispecies Permit Holders in the South Shore Group (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels on the south shore remained fairly stable from 1994 to 2001, averaging 167 vessels throughout the period (Table 622). The number of active vessels remained fairly consistent from 1994 to 1999, and declined in 2000 and 2001. Active vessels reporting landings of groundfish increased in number, from 38 in 1994 to 53 in 2001, remaining stable from 1995 to 1999 with an average of 48 vessels during these years. Total landings by vessels homeported in the south shore fluctuated, with a generally increasing trend across the time period while revenues declined slightly. Groundfish landings fluctuated as well but the trend did not reflect that for total landings. Groundfish dependence changed very little, averaging 48% from 1994 to 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	164	166	166	170	160	172	171	165
TOTAL								
Number Active*	66	70	69	79	69	70	56	55
Landings	3,350.9	7,409.5	7,127.1	6,798.5	5,336.8	3,676.8	6,177.6	3,247.5
Revenues	$3,671.5	$4,093.9	$4,425.8	$4,635.5	$3,201.0	$3,247.5	$3,149.1	$3,241.8
GROUNDFISH								
Number Active**	38	47	47	49	47	48	51	53
Landings	1,506.4	1,206.9	1,526.5	1,818.9	1,109.5	1,256.7	1,638.2	1,768.5
Revenues	$1,931.3	$1,392.7	$2,002.7	$2,573.5	$1,619.4	$1,483.0	$1,611.5	$1,598.8
Multispecies Revenues as a percent of Total Revenues	52.6%	34.0%	45.3%	55.5%	50.6%	45.7%	51.2%	49.3%

Table 622 - Fishing Activity for Vessels Homeported in the South Shore Group
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.3 Cape Cod and The Islands

Cape Cod and the islands in proximity to the Cape are located in Barnstable, Dukes and Nantucket counties.

Barnstable County	1990		2000		Percent change
Population (total individuals)	186,605		222,230		19.1%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	88.4%		91.8%		Difference = 3.4%
Poverty* (Number of families)	3,030		2,833		-6.5%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	6,314	7.1%	5,483	5.2%	-13.2%

Table 623 - Population, education, poverty and unemployment statistics for Barnstable County, MA (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Barnstable County increased more than 19% between 1990 and 2000 (Table 623). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 88.4% in 1990 to 91.8% in 2000, a rise of 3.4 percentage points over the period. The number of families living in poverty declined 6.5%, and the number of unemployed decreased 13.2% from 1990 to 2000. The unemployment rate declined from 7.1% of the labor force in 1990 to 5.2% in 2001.

Dukes County	1990		2000		Percent change
Population (total individuals)	11,639		14,987		28.8%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	90.4%		90.4%		Difference = 0%
Poverty* (Number of families)	121		192		58.7%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	380	6.1%	221	2.7%	-41.8%

Table 624 - Population, education, poverty and unemployment statistics for Dukes County, MA (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Dukes County is very small and demonstrated a greater increase than that of Barnstable County, rising 28.8% between 1990 and 2000 (Table 624). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school was 90.4% in 1990 and was reported at the same percentage in 2000. It is likely that this value was reported in error in the source database, given that the proportion of the adult population graduating from high school or higher has increased since 1990 in nearly all other counties examined. While the number of families living in poverty increased about 58.7%, the number of unemployed decreased 41.8% from 1990 to 2000. The unemployment rate declined from 6.1% of the labor force in 1990 to 2.7% in 2001.

Nantucket County	1990		2000		Percent change
Population (total individuals)	6,012		9,520		58.3%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	89.4%		91.6%		Difference = 2.2%
Poverty* (Number of families)	40		63		57.5%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	75	2.1%	244	4.3%	225.3%

Table 625 - Population, education, poverty and unemployment statistics for Nantucket County, MA (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

Nantucket County has the smallest population in Massachusetts, with an increase from about 6,000 to about 9,500 individuals over the past decade, representing a 58.3% increase from 1990 to 2000 (Table 625). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 89.4% in 1990 to 91.6% in 2000, a rise of 2.2 percentage points over the period. Both poverty and unemployment increased since 1990. The number of families living in poverty increased about 57.5% from 1990 to 2000, while the number of unemployed increased over 225% during this period. The unemployment rate rose from 2.1% of the labor force in 1990 to 4.3% in 2001. Despite the increase, unemployment remains low in Nantucket County.

Fishing Industry Employment in Cape Cod and The Islands

Barnstable County

The number of fishing establishments increased almost 10% from 1997 to 2000, averaging $36,670 per establishment in 2000 (Table 626). Fish and seafood wholesale establishments declined from 30 in 1998 to 24 in 2001, while the number of fish and seafood markets remained relatively stable over the period, averaging 21 establishments per year. There were no reported establishments in the fresh and frozen seafood processing, seafood product preparation and packaging, and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	902	921	952	990	NA
	Sum of Annual payroll	26,999	26,952	33,565	36,304	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	30	29	28	24
	Sum of Annual payroll	NA	4,701	5,158	5,931	6,551
44522** Fish and seafood markets	Sum of Total Establishments	NA	21	23	21	20
	Sum of Annual payroll	NA	1,404	1,584	1,630	1,923

Table 626 - Employment in fishing and related industries in Barnstable County, MA (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Dukes County

The number employed in the fishing sector increased from 1997 to 2000, averaging $20,172 per establishment in 2000 (Table 627). The fish and seafood wholesale sector reported three establishments in each year from 1998 to 2001. The fish and seafood markets sector also demonstrated stability over the time period, reporting one establishment each year. There were no reported establishments in the fresh and frozen seafood processing, seafood product preparation and packaging and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	103	109	109	110	NA
	Sum of Annual payroll	2,035	2,349	2,289	2,219	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	3	3	3	3
	Sum of Annual payroll	NA	198	174	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E

Table 627 - Employment in fishing and related industries in Dukes County, MA (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Nantucket County
The fishing sector reported 79 establishments in 1997 and 72 in 2000, and was unable to report number in 1998-1999 due to confidentiality reasons (Table 628). The average annual payroll for fishers in 2000 was $29,806. Two fish and seafood markets were reported in each year from 1998 to 2001 in Nantucket County. There were no establishments reported in any year for the fish and seafood wholesale, fresh and frozen seafood processing, seafood product preparation and packaging and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	79	D	D	72	NA
	Sum of Annual payroll	1,244	D	D	2,146	NA
44522** Fish and seafood markets	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E

Table 628 - Employment in fishing and related industries in Nantucket County, MA (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.8.3.1 Chatham/Harwichport, MA

Chatham/Harwichport, Massachusetts has been identified as a primary multispecies port group. Because of their proximity and similarity in fisheries, Chatham and Harwichport will be examined as one primary community group. Chatham and Harwichport are located in Barnstable County.

MARFIN – The MARFIN Report provides a detailed profile of Chatham, Massachusetts. It also includes a general profile of the Cape and Islands sub-region and Barnstable County, the county in which Chatham and Harwichport are located. These profiles should be referenced for social and demographic data not contained in this document.

Chatham, MA is a small coastal town on Cape Cod that is primarily known as a tourist destination. In addition to great beaches and quaint shops, another major attraction for tourists in Chatham is the opportunity to view fishermen unload their catch on the Town Pier. Chatham is a geologically diverse area that supports a vast number of different fisheries. According to the 1990 Census, the year-round population was 6,600 in 1989, but it is estimated that this number is increasing significantly in recent years. Close to half of the homes in Chatham are vacant in the winter months, and roughly one-third of the population is over 65. The population of Chatham in 1989 was 98.6% white, and the median household income was $31,315. The largest category of employed residents is in 1995 was the "services" category, and fishing made up 12% of this category, representing a significant portion of the overall employment in Chatham.

According to Chatham harbormaster documents, there are 279 commercial vessels at the Chatham Fish Pier and Stage Harbor mooring areas. It is estimated that about two-thirds of these vessels are small skiffs used for shellfishing. MARFIN found that there are currently 64 vessels with docking permits for the Town Pier; 22 gillnets, 17 longliners, 5 combination, 8 lobster vessels, several handline vessels, several draggers, and four party/charter boats. The Town Pier facilities are maintained by the Town and are dedicated solely to commercial fishing interests. In addition to the Town Pier, the majority of finfish activity actually takes place on the two private docks adjacent to the Town's facility. MARFIN found that the fleet in Chatham primarily targets Georges Bank stocks of groundfish and dogfish. The major species landed are codfish, dogfish, monkfish, haddock, bluefin tuna, and lobster. Chatham also has a substantial shellfish industry. There are numerous support services for the fishing industry in Chatham such as fish buyers, cutters, gear workers, and shellfish shuckers. Some fishermen in this area only fish part of the year, and others switch their gear to fish for longer periods of time. MARFIN found that the majority of vessels in Chatham are owner-operated.

The recreational sector is growing in Chatham. MARFIN determined that the favorite species for recreational fishermen in Chatham were striped bass, followed by bluefish, scup and cod. MARFIN found many fishing related organizations in Chatham and some of them are very active in supporting Chatham fishermen and representing their voice in fisheries management. All fishermen interviewed by MARFIN believe there has been a change in effort over the past ten years, accept for shellfish, which has remained stable over the years. Some Chatham fishermen voiced that they want to diversify, but they cannot get the permits to do it.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Chatham, Massachusetts on November 2, 2000, and many residents from Chatham and Harwichport attended and submitted comments. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of Chatham relate to frustration with the federal fisheries management process, the loss of flexibility for the small-boat fleet, and the loss of quality of life and sense of community resulting from turning fishing into a "numbers game." The groundfish regulation that Chatham residents feel have produced the most significant social impacts in this community is the May closure on Georges Bank for Georges Bank cod. This closure was cited for reducing fishing opportunities and flexibility. Please see the complete meeting report for additional discussion of these and other important social impact issues.

Fishing Activity in Chatham/Harwichport, MA

By Port of Landing

The number of active multispecies vessels and those landing groundfish generally decreased from 1994 to 1998 and fluctuated during the following years, with an increase in 2001 (Table 629). Overall, the number of active vessels demonstrated a declining trend from 1994 to 2001. Total landings in Chatham/Harwichport exhibited a slight downward trend with little fluctuation across the time period. Groundfish landings increased slightly from 1994 to 2001, with the greatest decline during the time period from 1997 to 1998 (26.5% decrease). Small mesh multispecies landings declined substantially from 1994 to 1995, gradually increasing during subsequent years. Small mesh non-multispecies landings increased almost seven-fold from 1995 to 1997, declined 92% in the following year, increased steeply from 1998 to 1999, then remained stable at the end of the time period. Other species comprised the majority of total landings in Chatham/Harwichport across the period, and demonstrated a generally declining trend.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	185	169	170	157	145	170	144	169
Number of Multispecies Vessels Landing Groundfish	148	131	142	129	123	128	131	137
TOTAL								
Landings	10,511.6	13,063.5	13,121.9	12,197.7	10,460.7	12,719.0	10,634.8	9,593.3
Revenues	$7,836.1	$7,740.3	$7,050.4	$7,109.3	$6,416.9	$8,452.2	$8,003.1	$6,861.7
GROUNDFISH								
Landings	4,359.3	3,479.7	3,712.9	4,766.6	3,502.8	4,752.7	5,191.3	4,852.7
Revenues	$5,820.9	$4,328.3	$3,999.2	$5,073.6	$4,509.7	$6,054.2	$5,719.0	$4,777.4
SMALL MESH MULTISPECIES								
Landings	566.0	58.6	80.0	120.1	40.4	133.8	133.1	223.5
Revenues	$211.1	$24.4	$24.4	$52.1	$18.0	$64.4	$51.3	$118.5
SMALL MESH NON-MULTISPECIES								
Landings	117.3	194.1	792.5	1,337.5	107.0	369.9	263.6	263.1
Revenues	$82.5	$125.5	$387.8	$518.4	$116.0	$158.6	$189.6	$148.5
OTHER SPECIES								
Landings	5,417.9	9,269.1	8,483.5	5,935.1	6,767.9	7,392.6	5,021.9	4,145.5
Revenues	$1,130.2	$2,334.3	$1,966.9	$1,181.2	$1,529.4	$1,622.1	$1,920.7	$1,400.5
HIGH VALUE SPECIES								
Landings	51.1	61.9	52.9	38.3	42.6	70.1	24.9	108.6
Revenues	$555.1	$885.7	$664.6	$282.6	$243.9	$552.9	$124.4	$435.9

Table 629 - Landings and Revenues from Multispecies Permit Holders in Chatham/Harwichport, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

After a 55% increase from 1994 to 1995, total landings decreased at an average of 8% per year from 1995 to 2001 (Table 630). Groundfish landings increased, from 4.3 million pounds in 1994 to 5.9 million pounds in 2001. The percentage of total revenues made up by groundfish revenues ranged from 49% (1995) to 74% (2000), fluctuating across the time period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	210	203	202	188	178	181	181	195
TOTAL								
Number Active*	123	115	122	118	106	117	102	121
Landings	12,006.8	18,593.5	16,170.2	13,195.3	12,064.4	13,487.7	10,960.5	10,851.7
Revenues	$8,852.4	$10,651.2	$9,005.8	$8,413.7	$8,718.3	$10,216.7	$8,692.0	$8,437.1
GROUNDFISH								
Number Active**	95	88	98	96	94	100	87	108
Landings	4,306.9	4,187.9	4,473.4	5,450.3	4,781.0	5,362.0	5,650.3	5,901.1
Revenues	$5,767.5	$5,204.5	$4,866.3	$5,836.8	$6,309.6	$6,958.6	$6,432.4	$6,034.5
Multispecies Revenues as a percent of Total Revenues	65.2%	48.9%	54.0%	69.4%	72.4%	68.1%	74.0%	71.5%

Table 630 - Fishing Activity for Vessels Homeported in Chatham/Harwichport, MA
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.3.2 Provincetown, MA

Provincetown, MA has been identified as a secondary multispecies port. Provincetown was examined as a separate community group because of its geographic isolation, unique fleet and industry characteristics, and its potential to be significantly impacted by changes to groundfish management measures. Provincetown is located in Barnstable County.

MARFIN – The MARFIN Report provides a detailed profile of Provincetown, Massachusetts. It also includes a general profile of the Cape and Islands sub-region and Barnstable County, the county in which Provincetown is located. These profiles should be referenced for social and demographic data not contained in this document.

Provincetown, often referred to as "P-town," is located at the tip of Cape Cod. MARFIN documented that it grew very slowly during the 18th century and its population fluctuated with the price of fish. By the mid 1800s as whaling became a major industry in New England, Provincetown transformed into "the largest and safest natural harbor on the New England coast." However, MARFIN reported that in the last 15 or so years, the commercial fishing industry in Provincetown has experienced a major downturn due to inshore area closures and declines in fish stocks. Because P-town did not diversify in its industry's development, the vessels have not been able to recover. Furthermore, there is little support from local representatives and the community at large to preserve the commercial fleet in Provincetown. MARFIN reports another disadvantage for P-town is its geographical location. Although Provincetown is the second deepest natural harbor in the world, its location is too far from major fish markets. The Portuguese community and influence in Provincetown is still very strong, but in the last 25 years, many more successful Portuguese fishermen have left and moved to New Bedford.

MARFIN documented that in 1996, there were 28 large vessels and 19 small jig boats, and only 17 of the 28 larger vessels were in safe working condition. In 2001, only eight of the 28 large vessels are reported to be in operation, along with twelve small longlining/jigging/lobstering boats. The MARFIN Report estimates that 25 individuals are involved in groundfish fishing, 20 in lobstering, and ten in other small-scale fisheries. It is predicted that these 55 individuals affect 26 households in Provincetown. MARFIN found that fishermen from Provincetown believe that closures in nearby waters, including Stellwagen, and limited DAS restrictions are the measures that have impacted fishermen most. MARFIN concludes that, "Provincetown epitomizes what can go wrong in a port highly reliant on one fishery albeit a multispecies fishery."

Fishing Activity in Provincetown, MA

By Port of Landing

The number of active multispecies vessels landing fish in Provincetown generally declined over the period from 1994 to 2001 (Table 631). Total landings decreased 54% from 1994 to 1995, generally increasing afterwards. Groundfish landings gradually declined from 1994 to 1999, with a sharp increase of around 87% from 1999 to 2000, followed by a 12% decline in the last year of the period. Small mesh non-multispecies landings declined substantially from 1994 to 1995, gradually increasing in the following years. Other species, which made up the bulk of total landings throughout the time period, declined through 1997, increased to a peak of 1.5 million pounds in 1998, and declined again afterwards.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	82	84	97	74	64	66	44	58
Number of Multispecies Vessels Landing Groundfish	57	61	54	40	41	39	30	38
TOTAL								
Landings	4,077.9	1,884.3	2,190.1	2,838.7	3,020.4	4,046.6	3,897.3	3,834.9
Revenues	$2,040.3	$1,981.0	$1,812.3	$2,264.1	$2,163.9	$3,024.3	$2,379.1	$4,144.2
GROUNDFISH								
Landings	813.9	972.8	834.2	906.9	736.8	686.8	1,286.1	1,130.0
Revenues	$1,000.5	$1,399.7	$977.2	$1,323.8	$896.3	$776.4	$1,204.6	$1,027.7
SMALL MESH MULTISPECIES								
Landings	1,774.8	77.0	715.7	1,217.0	717.6	1,800.8	1,452.2	1,690.6
Revenues	$502.6	$23.5	$290.2	$374.8	$412.5	$1,343.1	$512.5	$889.1
SMALL MESH NON-MULTISPECIES								
Landings	57.6	4.6	4.3	30.1	20.3	21.8	23.8	22.8
Revenues	$16.8	$3.2	$2.1	$8.4	$4.7	$16.9	$7.3	$11.2
OTHER SPECIES								
Landings	1,411.6	805.1	587.4	638.2	1,497.0	1,489.9	1,077.7	470.8
Revenues	$375.3	$274.4	$175.7	$186.4	$546.8	$566.4	$395.4	$170.7
HIGH VALUE SPECIES								
Landings	19.9	24.7	48.5	46.6	48.8	47.3	57.5	520.7
Revenues	$145.0	$280.3	$367.1	$370.7	$303.6	$321.6	$259.4	$2,045.5

Table 631 - Landings and Revenues from Multispecies Permit Holders in Provincetown, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/reve nues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

The number of permitted multispecies vessels increased slightly from 1994 to 1995, then generally declined in the following years (Table 632). The number of active vessels was stable in the first three years of the period, generally decreasing after 1996. 26 vessels landed groundfish in 1994 and 1995, this number declining to 23 in 1996 and remaining relatively stable through 2001. Total landings declined from 1994 to 1995, followed by a gradual upward trend through 2001. Revenues were relatively stable from 1994 to 2000, with a 79% increase from 2000 to 2001. Groundfish landings and revenues fluctuated, with an overall negative trend over the period. Groundfish revenues as a percentage of total revenues generally decreased from 55.4% in 1994 to 30.5% in 2001, with a peak of nearly 70% in 1995.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	48	52	46	38	35	39	36	34
TOTAL								
Number Active*	34	35	35	25	22	26	24	23
Landings	4,137.0	1,783.3	1,847.1	2,395.0	2,376.1	3,635.0	3,659.4	3,331.4
Revenues	$2,296.9	$2,058.7	$1,661.1	$2,053.5	$1,645.0	$2,932.5	$2,280.3	$4,083.2
GROUNDFISH								
Number Active**	26	26	23	21	21	22	22	23
Landings	950.6	969.7	778.8	958.9	678.1	813.7	1,366.6	1,354.2
Revenues	$1,272.7	$1,432.7	$949.4	$1,358.3	$831.9	$955.0	$1,325.0	$1,246.5
Multispecies Revenues as a percent of Total Revenues	55.4%	69.6%	57.2%	66.1%	50.6%	32.6%	58.1%	30.5%

Table 632 - Fishing Activity for Vessels Homeported in Provincetown, MA

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases

9.4.5.8.3.3 Other Cape Cod, MA

The Other Cape Cod, MA group is a secondary multispecies port group that includes Sandwich, Barnstable (Hyannis), Wellfleet, Woods Hole, Yarmouth, Orleans, and Eastham. These communities are located in Barnstable County.

MARFIN – The MARFIN Report provides detailed profiles of Hyannis and Sandwich, Massachusetts. It also includes a general profile of the Cape and Islands sub-region and Barnstable County, the county in which the Other Cape Cod communities are located. These profiles should be referenced for social and demographic data not contained in this document.

Fishing Activity in Other Cape Cod, MA

By Port of Landing

The number of active multispecies vessels declined after a stable period from 1994 to 1996 and increased again in 2001 (Table 633). Those vessels landing groundfish declined in number from 1994 to 1999, and increased rapidly in the last two years of the time period. Total landings and revenues generally declined from 1994 to 2001, although there was a small increase in 1998 due to increased landings of other species. Groundfish landings declined steeply from 1994 to 1996, followed by a sharp increase from 1996 to 1998. Landings again declined for two years and increased to the highest landings of the time series in 2001, at around 173,000 pounds. Landings of small mesh multispecies were zero or near-zero for all years. Landings of small mesh non-multispecies were also zero or near-zero in all years except for 1994. Other species landings declined from 1994 to 1995, increased from 1996 to 1998, and declined afterwards. High value species landings demonstrated a gradual decline over the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	69	67	69	40	32	41	25	60
Number of Multispecies Vessels Landing Groundfish	31	22	19	10	7	5	10	32
TOTAL								
Landings	2,421.6	1,329.1	1,429.3	1,393.3	1,682.0	1,643.9	1,395.8	1,270.2
Revenues	$3,621.9	$3,662.2	$3,463.9	$3,421.2	$2,756.3	$3,426.9	$2,104.8	$1,977.6
GROUNDFISH								
Landings	140.3	85.3	38.8	56.5	165.9	141.5	133.2	172.8
Revenues	$160.4	$103.1	$39.2	$72.2	$187.9	$161.3	$118.2	$166.6
SMALL MESH MULTISPECIES								
Landings	C	C	0.0	0.0	0.0	0.0	0.0	0.0
Revenues	C	C	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	137.4	C	5.2	C	C	0.0	C	C
Revenues	$66.2	C	$5.4	C	C	$0.0	C	C
OTHER SPECIES								
Landings	1,647.8	685.8	873.7	743.9	1,129.3	1,016.4	960.4	768.9
Revenues	$614.7	$402.2	$385.9	$325.2	$565.4	$518.3	$522.0	$446.0
HIGH VALUE SPECIES								
Landings	495.9	557.8	511.6	591.5	386.4	486.0	302.1	328.5
Revenues	$2,780.5	$3,156.9	$3,033.4	$3,021.8	$2,002.4	$2,747.3	$1,464.3	$1,365.0

Table 633 - Landings and Revenues from Multispecies Permit Holders in Other Cape Cod, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels homeported in Other Cape Cod decreased from 131 in 1994 to 91 in 1997, remained stable through 1998, and increased to 137, the maximum number of vessels for the time period, in 2001 (Table 634). The number of active vessels followed a similar trend, reaching 66 in 2001. The number of vessels landing groundfish was relatively stable from 1994 to 1996, declined in 1997, and increased in the following years. From 2000 to 2001, the number of vessels reporting groundfish landings increased 53%. Total landings declined slightly through the late 1990s and increased to the highest level of the time period in 2001, at 3.9 million pounds. Groundfish landings decreased from 1.6 million pounds in 1994 to 730,000 pounds in 1997, increasing in the following years. Dependence on groundfish declined from 46% in 1994 to 27% in 1997, generally increasing in the following years to 38% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	131	124	102	91	91	99	108	137
TOTAL								
Number Active*	40	53	42	33	37	42	44	66
Landings	3,291.6	2,918.4	2,665.2	2,432.9	2,757.7	2,823.9	3,470.9	3,945.7
Revenues	$4,645.9	$4,468.6	$4,449.4	$3,584.7	$3,712.3	$4,266.2	$4,877.5	$5,017.4
GROUNDFISH								
Number Active**	28	30	28	18	26	27	32	49
Landings	1,589.5	1,344.4	1,205.4	730.4	918.5	675.9	1,564.3	2,028.9
Revenues	$2,139.4	$1,853.7	$1,550.7	$964.8	$1,198.6	$897.1	$1,708.3	$1,906.7
Multispecies Revenues as a percent of Total Revenues	46.0%	41.5%	34.9%	26.9%	32.3%	21.0%	35.0%	38.0%

Table 634 - Fishing Activity for Vessels Homeported in Other Cape Cod, MA
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.3.4 The Islands, MA

The Islands, MA group is a secondary multispecies port group that includes Nantucket, Oak Bluffs, Tisbury, and Edgartown. These communities are in Nantucket and Dukes counties.

MARFIN – The MARFIN Report provides a detailed profile of Tisbury (Vineyard Haven), Massachusetts. It also includes a general profile of the Dukes County, the county in which the Islands communities are located. These profiles should be referenced for social and demographic data not contained in this document.

Fishing Activity on The Islands
By Port of Landing
The number of active multispecies vessels fluctuated from 1994 to 2001, reaching a maximum of 40 vessels in 1996 (Table 635). The number of multispecies vessels landing groundfish was relatively stable from 1994 to 1997, averaging 13 vessels during that period. No vessels reported landings of groundfish in 1999. Total landings fluctuated between 1994 and 2001, peaking in 1996 and 1999. The highest revenues were reported in 2000, as a result of an increase in landings of high value species during that year. Groundfish landings and revenues declined rapidly after 1996 and none were reported in 1999. In general, landings and revenues of all species groups on the islands nearby Cape Cod fluctuated from 1994 to 2001, and remained low throughout the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	22	15	40	30	23	26	24	18
Number of Multispecies Vessels Landing Groundfish	14	10	13	14	9	0	13	7
TOTAL								
Landings	15.3	12.6	102.9	40.2	26.0	103.7	91.3	102.0
Revenues	$44.1	$34.8	$235.5	$112.9	$71.2	$203.5	$238.6	$197.4
GROUNDFISH								
Landings	5.6	6.1	10.5	6.8	3.3	0.0	6.2	4.2
Revenues	$9.1	$9.5	$15.6	$9.4	$5.7	$0.0	$9.7	$7.1
SMALL MESH MULTISPECIES								
Landings	0.0	0.0	C	0.0	0.0	0.0	0.0	0.0
Revenues	$0.0	$0.0	C	$0.0	$0.0	$0.0	$0.0	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	C	C	0.0	0.1	C	0.0	C	0.1
Revenues	C	C	$0.0	$0.1	C	$0.0	C	$0.2
OTHER SPECIES								
Landings	3.9	2.1	85.8	15.9	14.6	103.5	60.6	97.4
Revenues	$6.4	$3.6	$183.6	$18.1	$28.9	$201.9	$110.7	$188.7
HIGH VALUE SPECIES								
Landings	5.6	4.3	6.5	17.4	8.0	C	24.5	C
Revenues	$28.5	$21.6	$36.3	$85.3	$36.4	C	$118.1	C

Table 635 - Landings and Revenues from Multispecies Permit Holders in The Islands Group, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels decreased from 33 in 1994 to 24 in 2001, with relative stability from 1998 to 2000 (Table 636). The number of vessels homeported in The Islands reporting landings increased from 15 vessels in 1994 to 24 vessels in 1995, declining afterwards and remaining relatively stable in the latter half of the time period. The number of vessels reporting landings of groundfish remained low throughout the period from 1994 to 2001, peaking at 7 vessels in 2000. Total landings increased by almost 90% from 1994 to 1995. After 1995, landings gradually declined until 1999, after which landings increased at an average of 42% per year. Groundfish landings were stable from 1994 to 1995 and peaked in 1996, constantly declining in the following years. Groundfish dependence declined overall, from nearly 28% in 1994 to 10% in 2001, averaging 14.6% over the time period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	33	36	24	25	22	21	21	24
TOTAL								
Number Active*	15	24	15	9	9	11	10	10
Landings	185.8	349.7	329.5	241.1	188.8	170.3	209.4	337.2
Revenues	$430.3	$1,140.5	$721.7	$403.7	$338.9	$419.2	$405.6	$568.7
GROUNDFISH								
Number Active**	3	3	4	4	3	2	7	4
Landings	81.0	81.6	115.7	87.0	31.0	C	40.0	56.4
Revenues	$120.1	$109.0	$138.8	$99.1	$36.4	C	$44.5	$57.4
Multispecies Revenues as a percent of Total Revenues	27.9%	9.6%	19.2%	24.5%	10.7%	~4%	11.0%	10.1%

Table 636 - Fishing Activity for Vessels Homeported in The Islands Group
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.4 New Bedford/Fairhaven, MA

New Bedford/Fairhaven, Massachusetts has been identified as a primary multispecies port group. These communities are located in Bristol County.

MARFIN – The MARFIN Report provides detailed profiles of New Bedford and Fairhaven, Massachusetts. It also includes a general profile of Bristol County, the county in which the New Bedford and Fairhaven are located. These profiles should be referenced for social and demographic data not contained in this document.

The New Bedford/Fairhaven region was the largest whaling area in the United States, and turned to harvesting and processing finfish and shellfish in the late 1880s. In 1997, the New Bedford Chamber of Commerce said that 60% of the city's economy was supported by the fishing industry. MARFIN noted that a 1999 report found that the seafood industry contributed nearly $609 million in sales and 2,600 jobs, 90 and 70 percent of the sales and employment harborwide. MARFIN found that in the New Bedford/Fairhaven area, there are roughly 75 seafood processors, and wholesale fish dealers, and 200 other shoreside industries; together these businesses employ around 6,000-8,000 additional workers.

Historically, scallops and yellowtail flounder made up the majority of landings in this area. New Bedford is a very industrial waterfront and while it dwarfs Fairhaven in size, there are numerous boat yards and marinas in Fairhaven as well. According to the 1990 Census, 99,922 people lived in New Bedford and 16, 132 in Fairhaven. New Bedford has the largest percentage of Portuguese population in the United States. MARFIN found that the majority of the dragger fleet is Portuguese, while the Norwegian population in New Bedford/Fairhaven work on scallop boats.

MARFIN found that New Bedford has the most developed infrastructure for groundfishing, and is the first port in New England for groundfish landings and revenues. MARFIN determined that there are roughly 250 fishing vessels in New Bedford; close to 100 of these are scallop vessels, and the majority of the rest are groundfish and monkfish vessels. The fleet in Fairhaven is mostly scallopers, but the size is about half of what it was before the groundfish and scallop Amendments were implemented. MARFIN estimates the numbers of fishermen to range from 1,800 to 3,000 for the area over time. The majority of boats in the area are owner-operated, and several owners have small fleets of vessels. The MARFIN Report found that it is more likely to find family members working together on groundfish vessels than on scallop vessels. There are numerous fishing-related organizations in the area, and they have a significant role in providing support the fishing community. MARFIN found that both federal and state legislators generally support the fishing industry in this area, and communication with these representatives is good.

When Georges Bank closed, many fishermen in this area went south to fish for fluke. Most fishermen interviewed in the later part of the MARFIN survey agreed that DAS is the regulation with the most impact on scallopers and groundfishermen. Fishermen are becoming more selective with their fishing effort, getting the most out of every fishing day possible, but some of the older fishermen are finding it difficult to adapt. MARFIN concluded that the uncertainty in the fishing industry and it's future is what most fishermen in this area are concerned about. Most fishermen who responded said they hoped their children would not go into fishing, due to the difficulties associated with constantly changing regulations and lack of financial security.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in New Bedford on November 8, 2000. Residents from New Bedford and Fairhaven attended and submitted comments about the impacts of groundfish regulations since Amendment 5. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of New Bedford relate to the loss of family traditions and the younger generation of fishermen due to uncertainty and instability, and safety concerns. The groundfish regulations that residents feel have produced the most significant social impacts in this community are the DAS allocations and reductions in DAS since Amendment 5. This community is home to many vessels with Individual DAS permits, and these boats have experienced a 50% reduction in their allocated DAS since Amendment 5. Comments concerning the social impacts of the DAS reductions relate to the loss of opportunity and flexibility as full-time operations were converted to part-time. Please see the complete meeting report for additional discussion of these and other important social impact issues.

Bristol County	1990		2000		Percent change
Population (total individuals)	506,325		534,678		5.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	65.0%		73.2%		Difference = 8.2%
Poverty* (Number of families)	10,118		10,981		8.5%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	21,423	8.1%	15,859	5.8%	-26.0%

Table 637 - Population, education, poverty and unemployment statistics for Bristol County, MA (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Bristol County increased 5.6% from 1990 to 2000 (Table 637). The percentage of individuals 25+ years graduating from high school or higher increased in the county over the decade, from 65% to 73.2%. This educational attainment level is low compared to other New England counties. The number of families in poverty increased 8.5% but unemployment dropped from 8.1% of the civilian labor force to 5.8% between 1990 and 2000.

Fishing Industry Employment in Bristol County, MA

The number employed in the fishing sector decreased from 940 in 1997 to 882 in 1999, increasing to 916 in 2000 (Table 638). The average payroll for those in the fishing sector was nearly $60,000, higher than that for most other counties in New England. The fish and seafood wholesale sector reported the second greatest number of establishments, but declined over the period, from 57 in 1998 to 43 in 2001. The number of establishments in the seafood product preparation and packaging sector remained relatively stable from 1998 to 2001, averaging 14 over the period. The number of fresh and frozen seafood establishments was also stable, averaging 13 from 1998 to 2001. Fish and seafood markets declined from 12 in 1998 to 10 in 2001, while the number of seafood canning establishments remained stable but was reported as a single establishment in the last three years of the period.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	940	901	882	916	NA
	Sum of Annual payroll	45,072	45,391	52,092	54,578	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	15	14	15	13
	Sum of Annual payroll	NA	11,012	12,612	20,721	16,081
311711** Seafood canning	Sum of Total Establishments	NA	2	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	13	13	14	12
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	57	54	51	43
	Sum of Annual payroll	NA	21,369	24,169	27,256	25,052
44522** Fish and seafood markets	Sum of Total Establishments	NA	12	11	10	10
	Sum of Annual payroll	NA	752	788	723	680

Table 638 - Employment in fishing and related industries in Bristol County, MA (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in New Bedford/Fairhaven, MA

By Port of Landing

More permitted multispecies vessels land groundfish in the ports of New Bedford and Fairhaven than in any other New England port group. This number generally increased, from 329 active vessels in 1994 to 386 vessels in 2001 (Table 639). The number of vessels reporting landings of groundfish decreased from 1994 to 1995, remained relatively stable for the next three years, decreased in 1998, increased to a peak of 290 vessels in 1999, and declined to the lowest reported number of the period in 2001. On average, 76% of active vessel reported landings of groundfish in each year from 1994 to 2001. Total landings and revenues increased consistently in New Bedford and Fairhaven from 1994 to 2001. Landings increased 78% from 1994 to 2001, with an average increase of 9.3% each year. Groundfish landings doubled between 1994 and 2001, from approximately 18.5 million pounds to 40.8 million pounds. Groundfish composed the majority of total landings in all years during the time period. Landings of other species, which made up the second greatest proportion of total landings, declined about 32% from 1994 to 2001. High value species landings increased gradually from 1994 to 1998, followed by a sharp increase during the later years of the time series. Landings of small mesh multispecies remained at a relatively constant low level for much of the period, increasing dramatically from around 195,000 pounds in 1999 to 2.8 million pounds in 2001. Small mesh non-multispecies landings rose to a sharp peak in 1998, then dropped in the following years.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	329	329	345	344	355	386	385	386
Number of Multispecies Vessels Landing Groundfish	282	270	278	275	263	290	281	232
TOTAL								
Landings	44,407.6	42,305.8	49,095.8	43,499.5	51,038.4	53,981.1	65,997.5	78,989.3
Revenues	$80,392.6	$80,115.4	$94,361.3	$82,341.2	$85,927.5	$121,396.0	$139,112.5	$131,168.7
GROUNDFISH								
Landings	18,482.3	17,196.3	20,856.6	20,653.2	21,219.3	22,908.3	31,066.4	40,864.0
Revenues	$24,281.4	$23,458.5	$25,653.6	$24,713.8	$26,995.7	$28,181.6	$32,358.5	$38,605.4
SMALL MESH MULTISPECIES								
Landings	78.2	41.5	91.7	85.8	59.9	194.9	1,131.0	2,789.2
Revenues	$23.3	$12.0	$30.3	$19.3	$15.4	$66.4	$401.2	$1,016.1
SMALL MESH NON-MULTISPECIES								
Landings	504.9	923.1	718.5	2,229.2	7,059.5	3,892.4	1,103.0	536.9
Revenues	$331.8	$540.8	$226.5	$828.2	$2,147.7	$1,691.1	$569.1	$305.9
OTHER SPECIES								
Landings	18,436.7	17,118.6	18,799.7	14,004.8	16,005.9	13,310.8	14,325.8	12,512.6
Revenues	$17,919.9	$17,497.9	$16,364.8	$15,025.0	$17,216.1	$17,033.1	$15,737.4	$11,051.9
HIGH VALUE SPECIES								
Landings	6,905.5	7,026.3	8,629.2	6,526.4	6,693.8	13,674.8	18,371.2	22,286.6
Revenues	$37,836.2	$38,606.3	$52,086.1	$41,754.8	$39,552.5	$74,423.9	$90,046.3	$80,189.4

Table 639 - Landings and Revenues from Multispecies Permit Holders in New Bedford/Fairhaven, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of multispecies vessels permitted in New Bedford and Fairhaven declined, from 293 in 1994 to 255 in 2001 (Table 640). The number of active vessels and those reporting landings of groundfish also declined, active vessels landing groundfish dropping almost 43% from 1994 to 2001. Total landings more than doubled from 1994 to 2001, with an average annual rise of 14.2%. Groundfish landings demonstrated a less dramatic increase over the time period. Dependence on groundfish decreased, from 30.5% in 1994 to 24.6% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	293	285	264	249	231	224	240	255
TOTAL								
Number Active*	244	231	225	204	194	193	204	209
Landings	54,459.6	53,241.6	69,639.4	69,832.5	58,917.5	57,739.6	76,987.8	119,063.6
Revenues	$83,192.8	$77,918.1	$89,807.9	$76,519.4	$76,419.0	$95,598.0	$112,387.5	$111,681.9
GROUNDFISH								
Number Active**	232	217	201	184	167	170	161	133
Landings	19,503.4	17,592.6	20,915.0	20,649.7	19,747.2	19,788.0	23,218.0	29,401.3
Revenues	$25,370.3	$23,762.3	$25,578.1	$24,905.3	$25,448.4	$24,502.1	$24,067.2	$27,510.5
Multispecies Revenues as a percent of Total Revenues	30.5%	30.5%	28.5%	32.5%	33.3%	25.6%	21.4%	24.6%

Table 640 - Fishing Activity for Vessels Homeported in New Bedford/Fairhaven, MA

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases

Fishing Activity in Other Bristol County, MA

By Port of Landing

The number of multispecies vessels landing fish in other communities in Bristol County was small, increasing slightly from 1994 to 1995, declining in 1996 and remaining stable for the next three years, and increasing slightly at the end of the time period (Table 641). The number of vessels landing groundfish increased from 6 to 12 vessels between 1994 and 1995 and declined afterwards, reaching a low of 2 vessels in 2001. Total landings increased after a period of decline from 1996 to 1997. Landings in 1995 and 1996 were the highest of the time series, at 1.2 million pounds and 1.4 million pounds, respectively. Groundfish landings demonstrated a large decline from 36,000 pounds in 1996 to 6,000 pounds in 2001. No small mesh multispecies were reported in Other Bristol County, and very low landings of small mesh non-multispecies. Other species and high value species composed the majority of total landings throughout the time period. Both species groups declined in the beginning of the time period and increased afterwards.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	15	20	12	10	12	13	17	14
Number of Multispecies Vessels Landing Groundfish	6	12	9	3	3	2	4	2
TOTAL								
Landings	651.3	1,153.6	1,425.7	739.7	848.5	723.3	623.1	875.2
Revenues	$1,134.3	$1,556.7	$1,187.4	$1,042.8	$1,446.2	$1,661.0	$1,430.0	$1,359.9
GROUNDFISH								
Landings	25.3	24.6	36.4	8.9	9.8	C	0.2	C
Revenues	$32.3	$27.4	$46.1	$10.0	$12.1	C	$0.1	C
SMALL MESH MULTISPECIES								
Landings	0.0	C	0.0	C	0.0	0.0	0.0	0.0
Revenues	$0.0	C	$0.0	C	$0.0	$0.0	$0.0	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	1.3	0.8	18.1	0.2	C	0.0	C	0.0
Revenues	$0.8	$0.3	$5.0	$0.0	C	$0.0	C	$0.0
OTHER SPECIES								
Landings	410.0	959.3	1,301.3	566.2	616.2	492.2	423.6	712.3
Revenues	$327.5	$763.2	$882.4	$427.8	$570.6	$702.8	$610.5	$751.4
HIGH VALUE SPECIES								
Landings	214.7	168.8	70.1	164.5	221.8	223.0	199.0	162.3
Revenues	$773.7	$765.8	$254.0	$605.0	$863.2	$948.2	$819.3	$608.0

Table 641 - Landings and Revenues from Multispecies Permit Holders in Other Bristol County, MA (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels homeported in Other Bristol County decreased from 40 vessels in 1994 and 1995 to 31 in 1997 (Table 642). This number did not change until 2000, with an increase to 36 vessels. The number of active vessels demonstrated a similar trend, increasing to a maximum of 14 vessels in 2001. Few vessels reporting landings of groundfish were homeported in this port group, increasing from 6 vessels in 1994 to 10 in 1996 and decreasing afterwards, with a local maximum of 7 vessels for the period from 1997 to 2001. Total landings increased from 1994 to 2001, with an average annual rise of 16%. Landings peaked in 1996 at 1.8 million pounds. Landings by vessels homeported in Other Bristol County were generally higher than those by vessels landing their catch in this region. Groundfish landings fluctuated across the time period, with a peak of around 89,000 pounds in 1999. The percent of total revenues comprised of groundfish revenues generally decreased, from 10% in 1994 to 2% in 2001. Groundfish dependence in this port group is low compared to other port groups in Massachusetts.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	40	40	32	31	31	31	36	37
TOTAL								
Number Active*	10	9	12	10	9	13	14	14
Landings	841.9	883.0	1,785.7	1,080.4	1,245.5	1,310.3	1,245.1	1,605.8
Revenues	$1,017.4	$1,150.2	$2,122.2	$1,833.4	$2,352.7	$3,034.4	$3,036.3	$2,740.3
GROUNDFISH								
Number Active**	6	6	10	3	4	5	7	4
Landings	71.9	40.6	53.8	12.6	34.1	88.7	34.0	51.4
Revenues	$105.0	$47.9	$71.9	$15.8	$52.6	$134.5	$51.2	$52.5
Multispecies Revenues as a percent of Total Revenues	10.3%	4.2%	3.4%	0.9%	2.2%	4.4%	1.7%	1.9%

Table 642 - Fishing Activity for Vessels Homeported in Other Bristol County, MA

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases.

9.4.5.8.5 Other Massachusetts

Fishing Industry Employment in Other Massachusetts

In other ports in Massachusetts, the sum of fishing establishments increased about 43% from 1997 to 1998, decreased to a low of 132 vessels in 1999, then increased again in 2000 (Table 643). The annual payroll for fishing establishments averaged just over $32,000 in 2000. Fish and seafood markets remained stable from 1998 to 2001, averaging 13 establishments over this period. There were 8 fish and seafood wholesale establishments in 1998 and 1999, this number decreasing to 5 in 2000 and 2001. No establishments were reported in fresh and frozen seafood processing, seafood product preparation and packaging, and seafood canning.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	148	211	132	150	NA
	Sum of Annual payroll	2,593	3,737	2,510	4,858	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	8	8	5	5
	Sum of Annual payroll	NA	947	955	1,045	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	12	13	13	13
	Sum of Annual payroll	NA	775	836	858	851

Table 643 - Employment in fishing and related industries in Other Massachusetts (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*

*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*

NAICS = North American Industry Classification System

***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*

***E** =reported as zero, may be in error or <$1,000*

***NA** = not applicable*

Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Other Massachusetts

By Port of Landing

The number of active multispecies vessels increased from 1994 to 1996, decreased through 2000, and rose again in 2001 (Table 644). Active vessels demonstrated a generally declining trend across the period. The number of multispecies vessels landing groundfish increased from 78 in 1994 to 140 in 2001, with a rapid rise at the end of the time period. Total landings remained relatively stable over the time period, while groundfish landings fluctuated with a generally increasing trend. Landings of other species composed the bulk of total landings throughout the period, and demonstrated a small overall decline.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	274	271	290	272	236	260	178	237
Number of Multispecies Vessels Landing Groundfish	78	94	83	91	82	88	94	140
TOTAL								
Landings	4,781.3	4,366.9	4,781.5	3,928.7	3,336.2	3,391.6	4,017.8	4,656.8
Revenues	$9,735.4	$12,145.5	$10,036.7	$7,595.7	$6,873.8	$7,536.8	$6,451.5	$7,469.2
GROUNDFISH								
Landings	839.2	1,298.4	1,373.8	1,619.6	1,966.7	1,067.4	1,670.9	2,350.6
Revenues	$1,185.3	$1,626.3	$1,688.7	$1,949.8	$2,758.5	$1,568.8	$2,121.3	$2,756.3
SMALL MESH MULTISPECIES								
Landings	0.1	3.6	3.4	0.5	0.9	4.9	4.7	0.3
Revenues	$0.0	$2.4	$1.1	$0.4	$0.6	$1.8	$1.7	$0.2
SMALL MESH NON-MULTISPECIES								
Landings	228.6	532.6	395.3	514.4	221.2	762.9	958.3	418.9
Revenues	$193.7	$398.3	$341.4	$423.5	$297.7	$592.1	$537.0	$219.6
OTHER SPECIES								
Landings	3,020.1	1,559.5	2,135.6	1,179.5	641.4	942.4	837.1	1,140.4
Revenues	$3,252.5	$2,242.5	$1,927.3	$1,317.6	$917.8	$1,344.7	$1,091.5	$1,620.8
HIGH VALUE SPECIES								
Landings	693.3	972.8	873.5	614.7	506.0	614.0	546.9	746.5
Revenues	$5,103.8	$7,875.9	$6,078.2	$3,904.4	$2,899.3	$4,029.4	$2,700.1	$2,872.3

Table 644 - Landings and Revenues from Multispecies Permit Holders in Other Massachusetts (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

The number of permitted multispecies vessels homeported in other Massachusetts ports averaged 396 from 1994 to 2001, decreasing slightly over the time period (Table 645). The number of active vessels and those reporting landings of groundfish decreased after 1994. In 2000, the number of vessels landing groundfish was only 22% of the total number of permitted multispecies vessels. Total landings decreased from 1994 to 2001, the greatest decline occurring from 1996 to 1998. Groundfish landings increased over the period, with a small decline from 1998 to 1999. Groundfish dependence remained low in all years, but increased from nearly 9% in 1994 to around 29% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	443	475	421	354	329	346	372	425
TOTAL								
Number Active*	158	150	161	138	130	130	106	123
Landings	8,081.6	7,932.2	8,430.3	6,122.3	4,404.0	4,831.8	4,792.2	5,193.9
Revenues	$11,921.3	$12,835.2	$12,885.0	$9,200.1	$7,995.2	$10,950.9	$8,556.2	$8,162.1
GROUNDFISH								
Number Active**	100	92	90	80	77	77	79	93
Landings	796.0	837.2	1,045.0	1,085.5	1,184.3	920.4	1,742.2	2,286.2
Revenues	$1,057.9	$1,051.9	$1,230.6	$1,335.1	$1,568.4	$1,156.0	$1,891.3	$2,345.5
Multispecies Revenues as a percent of Total Revenues	8.9%	8.2%	9.6%	14.5%	19.6%	10.6%	22.1%	28.7%

Table 645 - Fishing Activity for Vessels Homeported in Other Massachusetts
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.8.6 Massachusetts Summary

Massachusetts has the largest population of all coastal New England states. The unemployment rate in Massachusetts was higher than the national average and the number of families in poverty increased slightly from 1990 to 2000. The North shore, Boston area, and South shore demonstrated increases in groundfish dependence, while on Cape Cod, the Islands, and southeastern Massachusetts groundfish dependence declined. The fishing sector reported the greatest number of nonemployer establishments in Massachusetts from 1997 to 2000, with fish and seafood wholesale and fish and seafood markets sectors following. In southeastern MA and Cape Cod, no canning and few processing, preparation and packaging establishments were reported. In Massachusetts, multispecies permit holders have increased their activity in the groundfish fishery since 1994.

9.4.5.9 Rhode Island

Demographic Profile of Rhode Island

RHODE ISLAND	1990		2000		Percent change
Population (total individuals)	1,003,464		1,048,319		4.5%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	72.0%		78.0%		Difference = 6.0%
Poverty* (Number of families)	17,867		23,608		32.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	34,690	6.6%	29,859	5.6%	-13.9%

Table 646 - Population, education, poverty and unemployment statistics for the state of Rhode Island (1990 and 2000)

** data shown for 1989 and 1999*

Data source: U.S. Census Bureau

The total population in Rhode Island increased by 4.5% from 1990 to 2000 (Table 646). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 6% over the course of a decade. While the number of families below the poverty level increased substantially (32.1%), the unemployment rate declined, from 6.6% to 5.8% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								Two or more races	Hispanic or Latino(of any race)
		One race									
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race			
RHODE ISLAND	1,048,319	1,020,068	891,191	46,908	5,121	23,665	567	52,616		28,251	90,820
COUNTY											
Bristol County	50,648	50,134	49,034	349	82	505	14	150		514	572
Kent County	167,090	164,950	159,645	1,558	388	2,241	32	1,086		2,140	2,827
Newport County	**85,433**	**83,730**	**78,136**	**3,184**	**365**	**1,054**	**56**	**935**		**1,703**	**2,409**
Providence County	621,602	599,376	487,235	40,685	3,143	18,007	435	49,871		22,226	83,232
Washington County	**123,546**	**121,878**	**117,141**	**1,132**	**1,143**	**1,858**	**30**	**574**		**1,668**	**1,780**

Table 647 - Population by race in Rhode Island counties, 2000

Counties examined in Fishing Communities section of AHE in bold type.

Data source: U.S. Census Bureau

The total population of Rhode Island was around 1 million in 2000, just under that of Maine and New Hampshire (Table 647). Rhode Island is 85% white, 4.5% black/African American, 2.3% Asian, 2.7% of two or more races, and 5% other races. Less than 1% of the population is represented by American Indians and Alaska natives and native Hawaiians and other Pacific islanders. 8.7% of the state's population is

Hispanic or Latino of any race. Newport and Washington counties are over 90% white. While the total population of Washington County is larger than that of Newport County, Newport has a higher percentage of non-whites than Washington. Fishing regulations in Rhode Island are not likely to affect large minority populations.

9.4.5.9.1 Point Judith, RI

Point Judith, RI has been identified as a primary multispecies port. Point Judith is located in Washington County.

MARFIN – The MARFIN Report provides a detailed profile of Point Judith, Rhode Island. It also includes a general profile of Washington County, the county in which Point Judith is located. These profiles should be referenced for social and demographic data not contained in this document.

The MARFIN Report summarizes many important aspects of fishing communities in New England including demography, fisheries profiles, and social and economic trends in these communities. The following discussion highlights some of the important information about Point Judith that is presented in the MARFIN Report. The Point Judith/Galilee fishing village developed in the mid-1800s, with the first commercial fishermen using hook and line, beach seines, and floating fish traps. Today, Galilee is a major commercial fishing port. Tourism and gentrification are said to be forcing the fishing industry into the economic background in South County, RI. However, Pt. Judith is the second largest port in New England after New Bedford. Therefore, this port has remained a significant commercial fishing region despite pressures from the recreational sector and the tourism industry.

Point Judith is within the Narragansett township, and based on 1990 Census data, there were 14,985 people in this community, the median income in 1989 was $35,545, and the number of fishermen that live in this town has remained fairly constant over time. The MARFIN Report describes the Point Judith fleet as very diverse and adaptable. Overall, the fleet is fairly modern and in good repair due to the willingness of boat owners to innovate and use different gears and participate in different fisheries. When MARFIN collected their data, there were 134 commercial vessels in this port, ranging from 45-90 ft, with most being ground trawlers. The majority of larger vessels from Point Judith harvest squid, herring, and whiting. There were 40 inshore and 10 offshore lobster boats at the time MARFIN conducted their research. There are many support industries along the waterfront in Point Judith including dockside fuel pumps, restaurants, bait shops, commercial and recreational marine suppliers, and vessel repair shops. The Town Dock employs 50 people and 20-50 part-time employees.

The Town Dock receives a variety of groundfish, but about seven years ago, there was a decrease in landings of groundfish, and the processors shifted their focus. This has caused problems for the few fishermen that still target groundfish in the area. The MARFIN Report found that there are approximately 500 households involved in commercial fisheries in Point Judith, and another 400 indirectly dependent households. The majority of fishermen from Point Judith are first-generation white males. Most fishermen live within a 20-mile radius from the port. MARFIN concluded that the major issues facing this port include gear conflicts, area restrictions, and competition for resources with the recreational sector.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Point Judith on November 9, 2000. Residents from Point Judith attended and submitted comments about the impacts of groundfish regulations since Amendment 5. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of Point Judith relate to the loss of employment stability and year-round fishing opportunities and the long-term impacts of the loss of the community's fishing-related infrastructure. The groundfish regulations that residents feel have produced the most significant social impacts in this community are gear restrictions and DAS reductions since Amendment 5. Gear restrictions contribute to difficulty planning business and produce an immediate economic cost for impacted vessels. DAS reductions have reduced flexibility and the ability for Point Judith's vessels to shift effort into groundfish as restrictions in other fisheries increase.

Washington County	1990		2000		Percent change
Population (total individuals)	110,006		123,546		12.3%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	82.8%		88.6%		Difference = 5.8%
Poverty* (Number of families)	1,034		1,350		30.6%
	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
Unemployment (Pop. 16 yrs and over)	3,308	5.6%	3,463	5.1%	4.7%

Table 648 - Population, education, poverty and unemployment statistics for Washington County, RI (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Washington County increased 12.3% between 1990 and 2000 (Table 648). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 82.8% in 1990 to 88.6% in 2000, a rise of 5.8 percentage points over the period. The number of families living in poverty increased almost 31%, and number of unemployed increased as well. The unemployment rate dropped from 5.6% of the civilian labor force in 1990 to 5.1% in 2000.

Fishing Industry Employment in Point Judith, RI

Washington County
The number of reported fishing establishments increased 11% from 1997 to 1999, dropping slightly in 2000 (Table 649). The average payroll for individuals in the fishing sector was $68,134 in 2000. This is among the highest reported average annual payrolls for the fishing sector in New England counties. Fish and seafood wholesale reported a from 14 to 18 establishments in each year from 1998 to 2001. The number of establishments in the seafood product preparation and packaging, fresh and frozen seafood processing, and fish and seafood markets sectors remained small but stable over the period from 1998 to 2001. No seafood canning establishments were reported in Washington County during these years.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	674	727	749	743	NA
	Sum of Annual payroll	43,510	49,060	48,113	50,624	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	18	15	14	16
	Sum of Annual payroll	NA	4,977	4,738	5,046	5,556
44522** Fish and seafood markets	Sum of Total Establishments	NA	3	3	3	3
	Sum of Annual payroll	NA	163	232	321	E

Table 649 - Employment in fishing and related industries in Essex County, MA (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Point Judith, RI

By Port of Landing

The number of active vessels averaged 200 from 1994 to 1996, declining afterwards and remaining relatively stable from 1996 to 2000, increasing again in 2001 to the level close to that in 1994 (Table 650). The number of vessels landing groundfish declined 20% from 1995 to 1996 and declined more gradually in the following years. Total landings declined about 50% from 1994 to 2001, while groundfish landings increased steadily through 2000 before declining in the final year of the period. Small mesh non-multispecies made up the bulk of the total landings for most of the time period but declined almost 70% from 1994 to 2001. Of all the species groups, only groundfish and other species landings increased.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number Active Multispecies of Vessels	193	214	192	169	172	178	177	195
Number of Multispecies Vessels Landing Groundfish	128	137	110	107	107	111	104	109
TOTAL								
Landings	66,434.5	53,155.8	65,595.7	67,732.3	56,794.6	57,485.2	45,511.1	36,616.4
Revenues	$32,672.4	$32,040.9	$33,173.9	$37,842.9	$30,070.6	$36,342.3	$26,633.7	$22,634.2
GROUNDFISH								
Landings	1,346.9	1,079.9	1,536.2	1,849.1	2,438.9	2,662.9	3,130.0	2,211.5
Revenues	$1,562.1	$1,419.1	$1,909.7	$2,182.8	$3,001.3	$2,954.5	$2,940.5	$2,060.7
SMALL MESH MULTISPECIES								
Landings	13,303.6	9,418.9	10,613.5	11,236.2	11,843.3	9,564.7	11,139.4	8,154.8
Revenues	$4,934.2	$3,739.9	$3,998.4	$3,948.6	$3,797.7	$3,433.6	$3,652.3	$2,681.2
SMALL MESH NON-MULTISPECIES								
Landings	44,038.8	30,793.6	34,156.9	38,983.2	27,695.7	29,755.2	19,100.7	13,428.0
Revenues	$15,785.0	$13,564.9	$11,166.8	$16,611.7	$10,917.1	$12,819.4	$7,474.6	$7,515.2
OTHER SPECIES								
Landings	6,391.4	10,321.2	17,285.3	13,718.1	13,160.2	13,163.1	10,942.7	11,961.2
Revenues	$5,597.1	$7,783.6	$9,329.5	$8,310.0	$6,431.7	$7,845.5	$7,329.3	$6,940.1
HIGH VALUE SPECIES								
Landings	1,353.8	1,542.2	2,003.9	1,945.7	1,656.4	2,339.3	1,198.3	860.9
Revenues	$4,794.0	$5,533.4	$6,769.5	$6,789.7	$5,922.8	$9,289.3	$5,237.0	$3,437.0

Table 650 - Landings and Revenues from Multispecies Permit Holders in Point Judith, RI (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

The number of permitted multispecies vessels homeported in Point Judith declined in a stepwise fashion from 1994 to 2001, demonstrating the most stability towards the end of the time period, with a reported 124 vessels in 1999-2001 (Table 651). The numbers of active vessels and those landing groundfish fluctuated little from 1994 to 2001. Total landings by vessels homeported in Point Judith increased from 1994 to 1997, declining afterwards at an average of 13% each year through 2001. Groundfish landings increased over the time period, with a slight decline from 2000 to 2001. Groundfish dependence increased from 5.7% in 1994 to 21.4% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	136	140	133	133	126	124	124	124
TOTAL								
Number Active*	91	91	87	90	83	90	78	96
Landings	40,795.0	37,891.2	51,521.0	53,477.1	43,431.2	40,531.4	35,501.2	30,431.9
Revenues	$20,294.1	$19,709.7	$21,530.4	$28,387.8	$24,256.5	$26,492.0	$24,137.2	$20,037.5
GROUNDFISH								
Number Active**	69	66	62	66	65	71	60	71
Landings	1,015.0	705.6	1,455.6	2,145.5	3,467.9	3,568.0	5,321.0	4,513.2
Revenues	$1,151.4	$913.2	$1,808.4	$2,303.8	$4,192.3	$4,171.7	$5,324.2	$4,291.9
Multispecies Revenues as a percent of Total Revenues	5.7%	4.6%	8.4%	8.1%	17.3%	15.7%	22.1%	21.4%

Table 651 - Fishing Activity for Vessels Homeported in Point Judith, RI
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.9.2 Western Rhode Island

Western RI is a secondary multispecies port group that includes Charlestown, Westerly, South Kingstown (Wakefield), and North Kingstown (Wickford). These communities are located in Washington County.

Fishing Activity in Western Rhode Island

By Port of Landing
The total number of active multispecies vessels generally fluctuated from 1994 to 2001, reaching a maximum of 27 vessels in 2000 (Table 652). The number of vessels landing groundfish increased from zero in 1994 to 6 in 1996, fluctuating in the following years and reaching a maximum of 8 vessels in 2000. Total landings increased five-fold from 1994 to 1995, declining an average of 10% each year through 2001. Groundfish landings comprised a very small percentage of total catch, and fluctuated during the time period with the maximum landings of the period at 11,000 pounds in 1996. Small mesh non-multispecies landings made up the large majority of total landings, peaking in 1995 at nearly 40 million pounds.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	8	16	24	12	15	7	27	15
Number of Multispecies Vessels Landing Groundfish	0	3	6	2	4	2	8	2
TOTAL								
Landings	7,691.1	39,602.0	26,800.0	10,432.3	18,417.2	16,364.9	21,931.8	7,820.3
Revenues	$3,484.2	$10,998.1	$4,740.9	$801.3	$2,067.1	$1,512.3	$1,375.4	$1,064.6
GROUNDFISH								
Landings	0.0	0.5	11.1	C	27.0	C	2.0	C
Revenues	$0.0	$0.6	$11.2	C	$27.0	C	$2.4	C
SMALL MESH MULTISPECIES								
Landings	C	15.0	C	0.0	32.8	0.0	0.2	0.0
Revenues	C	$5.5	C	$0.0	$5.7	$0.0	$0.1	$0.0
SMALL MESH NON-MULTISPECIES								
Landings	7,642.5	39,501.5	26,710.4	10,422.7	18,326.3	16,357.4	21,901.8	7,803.7
Revenues	$3,462.4	$10,945.2	$4,618.5	$771.9	$1,980.9	$1,493.3	$1,267.0	$1,035.3
OTHER SPECIES								
Landings	39.1	84.6	73.8	1.0	29.8	6.2	15.1	10.8
Revenues	$17.1	$42.9	$93.9	$1.6	$48.2	$16.6	$37.2	$12.0
HIGH VALUE SPECIES								
Landings	C	0.5	4.7	7.1	C	C	12.6	C
Revenues	C	$3.9	$17.3	$26.5	C	C	$68.7	C

Table 652 - Landings and Revenues from Multispecies Permit Holders in Western RI (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases.

By Homeport

The number of permitted multispecies vessels decreased from 48 in 1994 to 35 in 2001, while the total number of active vessels remained relatively consistent, averaging 21over the time period (Table 653). Active vessels landing groundfish declined in number, from 16 in 1994 to 11 in 2001. Total landings dropped sharply from 1996 to 1997 then remained relatively constant through 2001. Groundfish landings increased consistently after 1995, with an average annual rise of 22%. Groundfish dependence increased from 4-5% early in the time series to nearly 28% by 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	48	49	44	34	39	43	40	35
TOTAL								
Number Active*	23	25	26	17	19	21	17	20
Landings	16,893.6	14,835.6	17,058.7	4,921.7	4,215.8	4,150.0	4,258.6	3,879.7
Revenues	$9,786.7	$8,783.0	$8,393.0	$4,126.3	$3,931.1	$4,021.8	$3,580.4	$3,197.8
GROUNDFISH								
Number Active**	16	16	15	12	13	12	13	11
Landings	410.4	284.9	301.7	374.7	591.3	674.2	757.1	887.7
Revenues	$503.6	$369.8	$332.0	$391.2	$704.0	$754.0	$856.5	$886.9
Multispecies Revenues as a percent of Total Revenues	5.1%	4.2%	4.0%	9.5%	17.9%	18.7%	23.9%	27.7%

Table 653 - Fishing Activity for Vessels Homeported in Western Rhode Island
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.9.3 Eastern RI

The Eastern RI group is a secondary multispecies port group that includes Newport, Tiverton, Portsmouth, Jamestown, Middletown, and Little Compton. These communities are located in Newport County.

MARFIN – The MARFIN Report provides detailed profiles of Newport, Tiverton, and Jamestown, Rhode Island. These profiles should be referenced for social and demographic data not contained in this document.

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Point Judith, Rhode Island on November 9, 2000. While meeting participants were primarily from Point Judith, they discussed fishing activity in Newport, RI. Most thought that while the Newport fleet is much smaller than the Point Judith fleet, it is currently more dependent on groundfishing. One person believed that the Newport fleet, which consists primarily of smaller, family-owned vessels, has been more negatively affected by the groundfish regulations than the Point Judith fleet. He said that only two fish buyers remain in Newport, and while most of the landings are trucked to Boston, some of the smaller fishing operations have been "caught in the middle" and are left with few opportunities in the fishery. In addition, of three large trap companies that used to be located in Newport (scup, squid), only one marginal operation remains. The summary from this meeting can be found in Appendix I.

Newport County	1990		2000		Percent change
Population (total individuals)	87,194		85,433		-2.0%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	82.8%		87.7%		Difference = 4.9%
Poverty* (Number of families)	1,241		1,212		-2.3%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	2,691	6.3%	2,310	5.3%	-14.2%

Table 654 - Population, education, poverty and unemployment statistics for Newport County, RI (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Newport County decreased 2% between 1990 and 2000, one of the few county populations in New England to undergo a reduction (Table 654). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 82.8% in 1990 to 87.7% in 2000, a comparable rise to that in Washington County, RI. The number of families living in poverty decreased over 2%, and number of unemployed decreased around 14%. The unemployment rate dropped from 6.3% of the civilian labor force in 1990 to 5.3% in 2000.

Fishing Industry Employment in Eastern RI

Newport County

The number of fishing establishments remained stable from 1997 to 1998, at 291 in each of those years. Fishing establishments declined to a small extent from 1998 to 2000 (Table 655). The average annual payroll for the fishing sector in 2000 was $53,450. Fish and seafood wholesale reported 11 establishments in 1997, this number declining to 8 in 2001. There were three fish and seafood markets in each year from 1998 to 2001, and one seafood product preparation and packaging establishment in those same years. There were no establishments reported in fresh and frozen seafood processing or seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	291	291	283	262	NA
	Sum of Annual payroll	15,145	14,840	12,877	14,006	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	11	9	8	8
	Sum of Annual payroll	NA	2178	2780	3653	4596
44522** Fish and seafood markets	Sum of Total Establishments	NA	3	3	3	3
	Sum of Annual payroll	NA	E	191	188	195

Table 655 - Employment in fishing and related industries in Newport County, RI (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*

*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Eastern Rhode Island

By Port of Landing

The number of multispecies vessels landing fish in eastern RI declined by over 50% from 1994 to 1996, generally increasing afterwards (Table 656). The number of vessels landing groundfish ranged from 37 (1996) and 66 (1999) during the period from 1994 to 2001. Total landings and revenues generally increased, while groundfish landings fell in the second year of the period, rose steadily from 1995 to 2000, and dropped slightly from 2000 to 2001. As for western RI, landings of small mesh non-multispecies composed the majority of total landings from 1994 to 2001. High value species landings declined most dramatically, dropping by 50% in two years (1995-1997).

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	110	85	52	75	82	98	102	98
Number of Multispecies Vessels Landing Groundfish	57	57	37	44	54	66	59	49
TOTAL								
Landings	11,858.0	8,979.6	9,310.9	9,001.6	10,073.0	16,653.0	14,449.6	23,198.0
Revenues	$9,286.0	$9,248.5	$6,564.3	$7,100.8	$9,064.3	$11,903.0	$9,737.4	$9,182.5
GROUNDFISH								
Landings	816.1	398.2	590.6	943.5	1,141.1	1,374.9	1,686.5	1,364.7
Revenues	$863.6	$477.9	$661.8	$948.8	$1,366.9	$1,534.1	$1,664.1	$1,238.0
SMALL MESH MULTISPECIES								
Landings	459.2	582.6	686.1	733.7	575.5	423.2	1,374.9	1,052.7
Revenues	$137.7	$157.8	$244.0	$183.2	$135.6	$130.4	$431.3	$303.7
SMALL MESH NON-MULTISPECIES								
Landings	7,237.8	3,767.8	5,725.5	3,302.3	1,958.6	8,263.1	6,851.8	15,281.4
Revenues	$2,813.6	$1,909.5	$1,301.1	$1,982.5	$1,326.1	$1,830.1	$1,770.1	$2,770.3
OTHER SPECIES								
Landings	2,465.5	3,218.2	1,597.3	3,525.2	5,695.5	5,883.0	3,897.7	5,083.7
Revenues	$2,297.6	$2,712.3	$1,446.7	$1,798.5	$3,298.0	$5,298.0	$3,021.4	$3,300.2
HIGH VALUE SPECIES								
Landings	879.5	1,012.8	711.6	496.9	702.4	708.9	638.6	415.5
Revenues	$3,173.6	$3,990.9	$2,910.7	$2,187.8	$2,937.8	$3,110.4	$2,850.4	$1,570.3

Table 656 - Landings and Revenues from Multispecies Permit Holders in Eastern RI (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.
Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.
Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.
Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.
High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.
C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**
Data source: NMFS Permit and Dealer databases

By Homeport

The total number of permitted multispecies vessels homeported in eastern RI remained relatively stable from 1994 to 2001, with a slight decline through the late-1990s (Table 657). The number of active vessels and those landing groundfish exhibited similar trends. The number of active vessels landing groundfish was about half the total number of permitted multispecies vessels throughout the time period. Total landings did not change dramatically between 1994 and 2001, and the general trend was slightly positive throughout the period. Groundfish landings more than doubled from 1994 to 2001, and groundfish revenues as a proportion of total revenues averaged about 16% over the time series but was somewhat inconsistent from year to year.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	60	70	58	49	49	52	56	59
TOTAL								
Number Active*	45	50	37	33	31	33	38	42
Landings	8,100.6	9,587.2	8,118.6	8,039.3	7,372.3	7,366.5	8,584.1	10,613.4
Revenues	$7,967.7	$9,066.5	$7,664.5	$6,181.9	$6,964.0	$8,125.5	$7,276.5	$7,998.0
GROUNDFISH								
Number Active**	30	31	22	24	21	23	25	29
Landings	821.2	702.6	907.4	1,095.8	1,164.7	859.8	1,112.4	1,836.5
Revenues	$932.8	$927.4	$1,177.2	$1,344.9	$1,402.9	$953.5	$1,079.7	$1,691.7
Multispecies Revenues as a percent of Total Revenues	11.7%	10.2%	15.4%	21.8%	20.1%	11.7%	14.8%	21.2%

Table 657 - Fishing Activity for Vessels Homeported in Eastern Rhode Island
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.9.4 Other Rhode Island

Fishing Industry Employment in Other Rhode Island

The number of fishing establishments in all other RI counties generally increased from 1997 to 2000 (Table 658). The average annual payroll for fishing establishments was $20,598 in 2000. The number of fish and seafood wholesale establishments decreased from 20 in 1998 to 17 in 2001, while the number of fish and seafood markets rose, from 16 in 1998 to 20 in 2001. Seafood product preparation and packaging and fresh and frozen seafood processing establishments declined slightly after 1998, with three establishments reported in each of the following years. No seafood canning establishments were reported in any year.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	352	391	411	408	NA
	Sum of Annual payroll	4,811	5,831	7,839	8,404	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	5	3	3	3
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	4	3	3	3
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	20	19	18	17
	Sum of Annual payroll	NA	2,953	4,953	2,441	2,175
44522** Fish and seafood markets	Sum of Total Establishments	NA	16	18	20	20
	Sum of Annual payroll	NA	741	1,595	2,087	2,274

Table 658 - Employment in fishing and related industries in Other Rhode Island (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Other Rhode Island

By Port of Landing

The number of active multispecies vessels declined from 1994 to 1999 and increased during the following two years, with a 35% overall decline across the period (Table 659). Multispecies vessels landing groundfish numbered 33 in 1994, declining 76% to 8 in 2001. Total landings declined, with the steepest drop from 1994 to 1995. Groundfish landings increased slightly from 1994 to 1996, then declined steeply from 145,000 pounds in 1996 to 39,000 pounds in 1997, continuing to decrease to very low levels in the later years of the time period. Small mesh non-multispecies, which comprised the majority of total landings from 1994 to 2001, declined rapidly as well, falling 81% from 1994 to 1995.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	83	63	69	41	42	29	33	54
Number of Multispecies Vessels Landing Groundfish	33	32	29	17	9	4	4	8
TOTAL								
Landings	23,423.3	6,223.5	4,760.8	7,167.6	7,757.3	1,979.6	2,035.2	517.7
Revenues	$13,234.2	$2,799.1	$2,725.5	$1,540.3	$1,700.9	$355.2	$377.5	$705.7
GROUNDFISH								
Landings	113.1	141.3	145.1	39.0	7.7	8.3	1.8	15.3
Revenues	$167.5	$222.0	$189.9	$42.3	$8.7	$8.7	$1.4	$16.3
SMALL MESH MULTISPECIES								
Landings	22.8	0.8	0.6	C	C	C	C	1.2
Revenues	$8.8	$0.3	$0.2	C	C	C	C	$0.9
SMALL MESH NON-MULTISPECIES								
Landings	20,213.1	3,759.9	2,608.0	6,270.5	7,416.3	1,826.1	1,887.7	26.3
Revenues	$9,655.0	$272.2	$484.0	$629.8	$378.4	$95.9	$94.2	$12.4
OTHER SPECIES								
Landings	2,610.0	2,149.3	1,879.2	788.4	72.7	29.3	126.0	456.1
Revenues	$1,918.0	$1,732.6	$1,534.9	$618.0	$121.6	$64.5	$195.2	$601.0
HIGH VALUE SPECIES								
Landings	464.3	172.3	127.9	67.8	255.2	40.0	19.4	18.8
Revenues	$1,484.9	$572.0	$516.5	$249.8	$1,191.7	$161.4	$86.5	$75.2

Table 659 - Landings and Revenues from Multispecies Permit Holders in Other Rhode Island (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for *confidentiality reasons.***

Data source: NMFS Permit and Dealer databases.

By Homeport

The number of permitted multispecies vessels homeported in Other RI generally declined from 1994 to 2001, as did the number of active vessels and those landing groundfish (Table 660). Total landings dropped after 1994 but doubled between 1996 and 1998, followed by a gradual decline of around 11% per year from 1999 to 2001. Groundfish landings increased steadily throughout the time period from 283,000 pounds in 1994 to 1.4 million pounds in 2001. Dependence on groundfish as a percentage of total revenues was low in all years but increased across the time period from 2% in 1994 to 17% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	128	121	100	87	89	96	105	98
TOTAL								
Number Active*	61	66	50	50	56	53	53	46
Landings	33,368.2	22,864.2	22,931.8	37,044.2	59,996.9	48,888.0	45,063.2	41,665.0
Revenues	$16,400.5	$14,403.6	$7,817.0	$8,103.8	$10,930.2	$15,904.5	$11,475.1	$8,047.7
GROUNDFISH								
Number Active**	39	39	23	22	33	31	28	26
Landings	283.4	226.3	307.3	597.2	918.4	986.4	1,295.1	1,428.9
Revenues	$332.8	$298.8	$381.4	$646.3	$1,047.6	$1,123.4	$1,222.8	$1,382.8
Multispecies Revenues as a percent of Total Revenues	2.0%	2.1%	4.9%	8.0%	9.6%	7.1%	10.7%	17.2%

Table 660 - Fishing Activity for Vessels Homeported in Other Rhode Island
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases

9.4.5.9.5 Rhode Island Summary

Rhode Island, though much smaller in area, has a total population comparable to that in the states of Maine and New Hampshire. In Rhode Island, most county business establishments were reported in fish and seafood wholesale. No canning and few processing establishments were reported from 1998 to 2001. Groundfish landings were not as substantial a component of total landings in Rhode Island as landings of small mesh non-multispecies and other species. In Rhode Island, multispecies permit holders have increased their activity in the groundfish fishery since 1994.

9.4.5.10 Connecticut

Demographic Profile of Connecticut

CONNECTICUT	1990		2000		Percent change
Population (total individuals)	3,287,116		3,405,565		3.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	79.2%		84.0%		Difference = 4.8%
Poverty* (Number of families)	43,965		49,983		13.7%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	95,819	5.4%	92,668	5.3%	-3.3%

Table 661 - Population, education, poverty and unemployment statistics for the state of Connecticut (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Connecticut increased by 3.6% from 1990 to 2000 (Table 661). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 4.8% over the course of a decade, from 79.2% in 1990 to 84% in 2000. While the number of families below the poverty level increased 13.7% from 1989 to 1999, the unemployment rate declined slightly over the decade, from 5.4% to 5.3% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
CONNECTICUT	3,405,565	3,330,717	2,780,355	309,843	9,639	82,313	1,366	147,201	74,848	320,323
COUNTY										
Fairfield County	**882,567**	**860,616**	**699,992**	**88,362**	**1,736**	**28,689**	**366**	**41,471**	**21,951**	**104,835**
Hartford County	857,183	837,384	659,192	99,936	1,984	20,775	370	55,127	19,799	98,968
Litchfield County	182,193	180,216	174,484	1,998	319	2,137	43	1,235	1,977	3,894
Middlesex County	**155,071**	**152,654**	**141,555**	**6,856**	**269**	**2,419**	**58**	**1,497**	**2,417**	**4,649**
New Haven County	**824,008**	**806,188**	**654,244**	**93,239**	**2,035**	**19,220**	**290**	**37,160**	**17,820**	**83,131**
New London County	**259,088**	**252,141**	**225,406**	**13,703**	**2,487**	**5,075**	**151**	**5,319**	**6,947**	**13,236**
Tolland County	136,364	134,523	125,915	3,708	290	3,090	43	1,477	1,841	3,873
Windham County	109,091	106,995	99,567	2,041	519	908	45	3,915	2,096	7,737

Table 662 - Population by race in Connecticut counties, 2000
Counties examined in Fishing Communities section of AHE in bold type.
Data source: U.S. Census Bureau

The total population of Connecticut was around 3.4 million in 2000, just over half that of Massachusetts (Table 662). 81.6% of Connecticut's population is white, with just over 9% black/African American, 2.4% Asian, 2.2% of two or more races, and less than 5% other races. The population is 9.4% Hispanic/Latino of any race. Fairfield and New Haven counties have very similar demographic profiles, with populations of over 800,000 composed of around 79% whites, 10-11% blacks/African Americans, 2.3-3.3% Asians, 2.2-2.5% of two or more races, and over 4.5% other races. 10-12% of the total populations in these counties are Hispanic/Latino of any race. The populations of Middlesex and New London counties are less racially diverse but demonstrate similar racial distributions to Fairfield and New Haven counties.

9.4.5.10.1 Coastal CT

The Coastal CT group is a secondary multispecies port group that includes Stonington, New London, Noank, Lyme, Old Lyme, East Lyme, Groton, and Waterford. These communities are located in Fairfield, Middlesex, New Haven, and New London counties.

MARFIN – The MARFIN Report provides detailed profiles of New London and Stonington, Connecticut. It also includes a general profile of the Connecticut sub-region. These profiles should be referenced for social and demographic data not contained in this document.

New London County	1990		2000		Percent change
Population (total individuals)	254,957		259,088		1.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	80.9%		86.0%		Difference = 5.1%
Poverty* (Number of families)	3,155		3,021		-4.2%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	7,675	6.0%	5,397	4.1%	-29.7%

Table 663 - Population, education, poverty and unemployment statistics for New London County, CT (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in New London County remained relatively stable between 1990 and 2000, increasing only 1.6% over the decade (Table 663). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 80.9% in 1990 to 86% in 2000, a rise of 5.1 percentage points over the period. The number of families living in poverty decreased 4.2%, while the number of unemployed decreased nearly 30% from 1990 to 2000. The unemployment rate declined from 6.0% of the labor force in 1990 to 4.1% in 2001.

Middlesex County	1990		2000		Percent change
Population (total individuals)	143,196		155,071		8.3%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	82.6%		88.7%		Difference = 6.1%
Poverty* (Number of families)	997		951		-4.6%
	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
Unemployment (Pop. 16 yrs and over)	3,393	4.1%	4,176	4.8%	23.1%

Table 664 - Population, education, poverty and unemployment statistics for Middlesex County, CT (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Middlesex County increased 8.3% from 1990 and 2000 (Table 664). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 82.6% in 1990 to 88.7% in 2000, a rise of 6.1 percentage points over the period. The number of families living in poverty decreased 4.6%, while the number of unemployed increased just over 23% from 1990 to 2000. The unemployment rate increased from 4.1% of the labor force in 1990 to 4.8% in 2001.

New Haven County	1990		2000		Percent change
Population (total individuals)	804,219		824,008		2.5%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	77.5%		83.0%		Difference = 5.5%
Poverty* (Number of families)	12,633		14,766		16.9%
	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
Unemployment (Pop. 16 yrs and over)	25,079	5.8%	24,864	5.9%	-0.9%

Table 665 - Population, education, poverty and unemployment statistics for New Haven County (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in New Haven County increased just 2.5% from 1990 and 2000 (Table 665). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 77.5% in 1990 to 83% in 2000, a rise of 5.5 percentage points over the period. The number of families living in poverty increased nearly 17%, while the number of unemployed decreased slightly (~1%) from 1990 to 2000. The unemployment rate increased from 5.8% of the labor force in 1990 to 5.9% in 2001.

Fairfield County	1990		2000		Percent change
Population (total individuals)	827,645		882,567		6.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	81.0%		84.4%		Difference = 3.4%
Poverty* (Number of families)	9,889		11,488		16.2%
	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
Unemployment (Pop. 16 yrs and over)	24,559	5.4%	21,306	4.8%	-13.2%

Table 666 - Population, education, poverty and unemployment statistics for Fairfield County (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Fairfield County increased 6.6% from 1990 and 2000, the greatest percent increase of all counties in the Coastal CT port group (Table 666). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 81% in 1990 to 84.4% in 2000, a rise of 3.4 percentage points over the period. The number of families living in poverty increased nearly 16.2%, while the number of unemployed decreased 13.2% from 1990 to 2000. The unemployment rate increased from 5.4% of the labor force in 1990 to 4.8% in 2001.

Fishing Industry Employment in Coastal Connecticut

New London County

The number of fishing establishments in New London County increased about 4% from 1997 to 1998, decreasing 10% in the following year and remaining stable from 1999 to 2000 (Table 667). The average payroll for fishing establishments in the county was $43,686 in 2000. Fish and seafood wholesale establishments and fish and seafood markets numbered between 3 and 5 from 1998 to 2001, remaining stable throughout the period. No establishments were reported in the fresh and frozen seafood processing, seafood product preparation and packaging, and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	163	170	153	153	NA
	Sum of Annual payroll	10,040	11,262	7,257	6,684	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	5	4	5	3
	Sum of Annual payroll	NA	E	E	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	4	4	4	4
	Sum of Annual payroll	NA	E	E	247	E

Table 667 - Employment in fishing and related industries in New London County, CT (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*

Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*

NAICS = North American Industry Classification System

D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*

E *=reported as zero, may be in error or <$1,000*

NA *= not applicable*

Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Middlesex County

Fewer fishing establishments were reported in Middlesex County than New London County, decreasing over the period from 1997 to 2000 (Table 668). The average payroll for individuals employed in the fishing sector was $29,237 in 2000. Between 1 and 2 establishments were reported in the fish and seafood wholesale and fish and seafood markets sectors from 1998 to 2001. No establishments were reported in the fresh and frozen seafood processing, seafood product preparation and packaging, and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	46	41	33	38	NA
	Sum of Annual payroll	2,704	2,115	2,724	1,111	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	1	2	1	1
	Sum of Annual payroll	NA	E	E	E	E

Table 668 - Employment in fishing and related industries in Middlesex County, CT (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

New Haven County
The number of fishing establishments reported in New Haven County fluctuated slightly from 1997 to 2000, averaging 83 over the period (Table 669). The average payroll for each fishing sector participant was $24,506 in 2000. Between 6 and 8 establishments were reported in the fish and seafood wholesale sector from 1998 to 2001. Eight fish and seafood markets were reported in all years from 1998 to 2001, except for a peak of twelve establishments in 1999. No establishments were reported in the fresh and frozen seafood processing, seafood product preparation and packaging, and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	75	87	81	87	NA
	Sum of Annual payroll	3,622	5,044	3,144	2,132	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	7	8	6	6
	Sum of Annual payroll	NA	E	2,003	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	8	12	8	8
	Sum of Annual payroll	NA	432	490	507	586

Table 669 - Employment in fishing and related industries in New Haven County, CT (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fairfield County
The composition of reported establishments in fishing and related industries in Fairfield County closely mirrored that of New Haven County (Table 670). Fishing establishments averaged 79 from 1997 to 2000, with an average payroll of $33,767 in 2000. Fish and seafood wholesale establishments numbered between 6 and 8 from 1998 to 2001, while 11 to 13 fish and seafood markets were reported in these years. No establishments were reported in the fresh and frozen seafood processing, seafood product preparation and packaging, and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	76	84	83	73	NA
	Sum of Annual payroll	4,219	4,238	3,223	2,465	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	8	7	6	7
	Sum of Annual payroll	NA	E	E	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	13	11	11	13
	Sum of Annual payroll	NA	1,426	1,565	E	2,164

Table 670 - Employment in fishing and related industries in Fairfield County, CT (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Connecticut

Note on Connecticut commercial fishery data:

Landings and revenues for the state of Connecticut are reported from CT state dealer records, rather than in the NMFS commercial fisheries dealer database. Because Connecticut landings and revenues are reported as aggregate records to NMFS, it was not possible to examine CT fishing activity by county/sub-region or by vessels homeported in the state. Landings and revenues are available from 1995 through 2000.

The number of permitted multispecies vessels declined 44% from 168 in 1995 to 94 in 2000 (Table 671). Total landings remained relatively stable from 1995 to 2000, falling slightly in 1997 and 1998. Groundfish landings more than doubled over this time period, from 406,000 pounds in 1995 to 1.1 million pounds in 2000. Landings of small mesh multispecies composed the majority of total landings over the time period and remained stable, with a peak of 7 million pounds in 1999. Small mesh non-multispecies and other species landings were fairly stable from 1995 to 2000 while high value species landings increased about 48% during these years. In general, despite the decrease in number of multispecies vessels in Connecticut, landings of all species remained relatively stable or increased between 1995 and 2000.

Fishing Year	1994	1995	1996	1997	1998	1999	2000
Number Of Permitted Multispecies Vessels	Not. Avail.	168	163	135	121	112	94
				TOTAL			
Landings	Not Avail.	11,072.2	10,086.5	9,693.0	9,056.7	12,860.7	10,919.3
Revenues	Not Avail.	$10,518.4	$8,618.3	$8,377.5	$8,890.6	$13,018.4	$10,538.7
				GROUNDFISH			
Landings	Not Avail.	405.9	488.7	505.3	699.0	582.1	1,071.3
Revenues	Not Avail.	$499.7	$529.5	$576.9	$818.9	$604.0	$919.0
				SMALL MESH MULTISPECIES			
Landings	Not Avail.	5,671.9	5,157.7	4,514.5	4,438.9	7,060.8	5,166.5
Revenues	Not Avail.	$2,303.3	$2,009.6	$1,601.7	$1,587.9	$3,639.0	$1,892.7
				SMALL MESH NON-MULTISPECIES			
Landings	Not Avail.	1,703.1	1,168.2	2,038.6	1,115.5	2,089.6	1,812.6
Revenues	Not Avail.	$932.4	$611.2	$1,147.2	$653.6	$1,230.8	$1,061.2
				OTHER SPECIES			
Landings	Not Avail.	2,368.2	2,468.8	1,928.3	1,758.8	1,861.4	1,635.2
Revenues	Not Avail.	$2,582.0	$2,076.9	$1,767.0	$1,542.6	$2,048.0	$1,440.9
				HIGH VALUE SPECIES			
Landings	Not Avail.	767.4	659.7	629.5	885.7	1,134.1	1,132.7
Revenues	Not Avail.	$4,079.8	$3,333.6	$3,240.1	$4,215.1	$5,438.2	$5,166.0
				MISC SPECIES			
Landings	Not Avail.	155.7	143.4	76.8	158.8	132.7	101.1
Revenues	Not Avail.	$121.2	$57.6	$44.7	$72.6	$58.4	$58.9

Table 671 - Landings and Revenues from Multispecies Permit Holders in Connecticut (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data Source: CT State Dealer Records

9.4.5.10.2 Other Connecticut

Fishing Industry Employment in Other Connecticut Counties

Fishing establishments remained stable from 1997 to 2000, averaging 51 over the period (Table 672). The average annual payroll for these establishments increased substantially from $10,200 from 1997 to 1999, to $25,118 in 2000. Between 6 and 8 establishments were reported for the fish and seafood wholesale and fish and seafood markets sectors from 1998 to 2001. No establishments were reported in the fresh and frozen seafood processing, seafood product preparation and packaging, and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	50	49	54	51	NA
	Sum of Annual payroll	529	475	557	1,281	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	6	8	7	7
	Sum of Annual payroll	NA	2,770	97	146	150
44522** Fish and seafood markets	Sum of Total Establishments	NA	6	7	7	8
	Sum of Annual payroll	NA	158	260	282	333

Table 672 - Employment in fishing and related industries in Other Connecticut (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.10.3 Connecticut Summary

In Connecticut, Other Species landings composed the majority of total landings for all years from 1994 to 2001. Groundfish landings increased, although the number of permitted multispecies vessels declined over this period. The number of nonemployer establishments reported in the fishing sector generally remained stable from 1997 to 2000. No canning, processing, preparation and packaging establishments were reported in Connecticut.

9.4.5.11 New York

This section summarizes available information about fishing communities in the state of New York and includes references to the appropriate documents, which are not included as part of this document.

In May 2001, TechLaw Inc. prepared a report for New York Sea Grant entitled, *The Economic Contribution of the Sport Fishing, Commercial Fishing, and Seafood Industries to New York State*. This study t estimate the economic importance of these industries to the state was sponsored by New York Sea Grant and conducted in consultation with an Advisory Committee of stakeholders from industry and government. Economic contribution is expressed in terms of 1999 dollar value and employment, which includes employment in the industries themselves and equivalent jobs created as an impact of the economic activity within the industries. The estimates of economic contribution were made using an econometric model. Basic expenditures for each industry were inputs to the model, and they were derived from the IMPLAN input/output model.

The overall economic contribution of these three industries to the state of New York is estimated to be $11.5 billion. The contribution of direct activity within the industries is estimated at $5.7 billion, and the indirect economic impact (sales of related goods and services) is estimated at $5.9 billion. The employment contribution of these three industries is reported to be 113,300 direct jobs and 64,600 equivalent jobs generated from economic activity within the industries. The Report estimates that commercial fishing alone employs 10,500 in New York state. This Report describes activity and trends in almost all sectors of the commercial and recreational fisheries in New York and provides much additional and useful information about New York's fishing communities.

Demographic Profile of New York

NEW YORK	1990		2000		Percent change
Population (total individuals)	17,990,455		18,976,457		5.5%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	74.8%		79.1%		Difference = 4.3%
Poverty* (Number of families)	454,872		535,935		17.8%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	618,903	6.9%	640,108	7.1%	3.4%

Table 673 - Population, education, poverty and unemployment statistics for the state of New York (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in New York increased by 5.5% from 18 million in 1990 to 19 million in 2000 (Table 673). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 4.3% over the course of a decade, from 74.8% in 1990 to 79.1% in 2000. The number of families below the poverty level increased 17.8% from 1989 to 1999 and the unemployment rate increased over the decade, from 6.9% to 7.1% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race							Two or more races	Hispanic or Latino(of any race)
		One race								
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
NEW YORK	18,976,457	18,386,275	12,893,689	3,014,385	82,461	1,044,976	8,818	1,341,946	590,182	2,867,583
Selected Counties										
Kings County	**2,465,326**	**2,360,035**	**1,015,728**	**898,350**	**10,117**	**185,818**	**1,465**	**248,557**	**105,291**	**487,878**
Nassau County	**1,334,544**	**1,306,248**	**1,058,285**	**134,673**	**2,112**	**63,140**	**400**	**47,638**	**28,296**	**133,282**
Queens County	**2,229,379**	**2,093,209**	**982,725**	**446,189**	**11,077**	**391,500**	**1,331**	**260,387**	**136,170**	**556,605**
Suffolk County	**1,419,369**	**1,390,185**	**1,200,755**	**98,553**	**3,807**	**34,711**	**484**	**51,875**	**29,184**	**149,411**

Table 674 - Population by race in selected New York counties, 2000
Counties examined in Fishing Communities section of AHE in bold type.
Data source: U.S. Census Bureau

The total population of New York state far exceeds the *combined* population of New England states. In New York, around 68% of the population is white, 16% black/African American, 5.5% Asian, just over 3% of two or more races, 0.4% American Indian/Alaska native, and 7% of other races (Table 674). 15% are Hispanic/Latino of any race. Queens and Kings counties have a greater percentage of non-whites than Nassau and Suffolk counties, the total populations composed of 20-36% black/African American, 8-18% Asian, 4-6% of two or more races, less than 1% American Indian/Alaska native and Hawaiian, and 10-12%

other races. 20-25% of the populations in Queens and Kings counties are Hispanic/Latino of any race. Nassau and Suffolk counties have very similar racial distributions within the total populations, which are 79.3% and 84.6% white, respectively. Blacks/African Americans, Asians, and individuals of two or more races make up the next largest proportions of the total. Each county's population is made up of approximately 10% Hispanic/Latino of any race.

9.4.5.11.1 Eastern Long Island, NY

Eastern Long Island, NY has been identified as a primary multispecies port group. This group includes the ports of Montauk, Hampton Bays (Shinnecock), and Greenport.

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of Montauk, Hampton Bays, and Greenport, along with information about many other smaller ports in Eastern Long Island. These profiles should be referenced for social and demographic data not contained in this document.

Due to funding constraints, McCay and Cieri Report is not a complete analysis of the dependence of these communities on fishery resources, but it can provide guidance about how vulnerable these communities are to regulatory change. There are many other smaller ports in eastern Long Island that were discussed in the McCay and Cieri Report, but only the communities specified in this group are discussed below.

Greenport is the largest port on the North Fork of Long Island with five large offshore vessels, one medium-sized dragger, two small 40' draggers, 3 trap vessels, 4 lobstermen, 4 or 5 conch potters, 4 or 5 gillnetters, and 25 or so baymen. The fishermen from this area have adapted over time and taken advantage of different gears and specie s. McCay and Cieri found that despite local support, the commercial fleet in Greenport has decreased significantly in the last 20 years. Many fishermen in this area offload in a variety of ports in the area, and do not always land primarily in Greenport. There are several charter and party boats in the area.

Montauk is located at the tip of the South Fork on Long Island, and is the largest fishing port in New York. McCay and Cieri found that otter trawls and longlines are the principle gear types, and loligo squid and silver hake were the two most important finfish species in 1998. Furthermore, Montauk is the leading U.S. port for tilefish landings, which amounted to 21% of total revenues for Montauk in 1998. The majority of fish landed in Montauk is sold on consignment in the Fulton Fish Market in New York City. When researching the number of crew employed in the area, one individual told McCay and Cieri that there are about three longliners who employ eight per boat (double crew), he employs ten on his two boats, the two largest vessels each employ ten crew members, and there are about 20-30 lobstermen.

Hampton Bays/Shinnecock is the second largest port in New York after Montauk. McCay and Cieri determined that this port is primarily a dragger fishing port, and loligo squid and whiting made up 70% of total revenues in 1998. There is a Municipal Dock on the west side of the Shinnecock Inlet, a commercial fish dock, the local fisherman's cooperative, and a marina. One respondent in this report estimated that there are 30 boats working out of Shinnecock, and fewer are owner-operated than in the past. Even though fishermen are landing less, prices have been good, so fishermen appear to be sustaining themselves pretty well in this area. The town of South Hampton is generally supportive of the commercial fishing industry, but some fishermen feel that the regulators are trying to "squeeze them out."

Social Impact Informational Meetings – Council staff conducted a social impact informational meeting in Riverhead, New York on November 21, 2000. Residents from Montauk, Greenport, and Hampton Bays attended and submitted comments about the impacts of groundfish regulations since Amendment 5. The summary from this meeting can be found in Appendix I.

Based on comments received at the Social Impact Informational Meetings, the most important social impact issues for residents of Eastern Long Island relate to a loss of morale from regulatory discarding (not groundfish), problems finding and keeping crew, and a general loss of faith in the federal fisheries management process. Meeting participants feel that regulations in other fisheries have produced the most significant social impacts in the past six years. They cited Groundfish DAS as offering flexibility, stability, and opportunity when other fisheries close due to quotas. For these communities, groundfish has become a more important alternative fishery as restrictions in other fisheries increase. Please see the complete meeting report for additional discussion of these and other important social impact issues.

Suffolk County	**1990**		**2000**		**Percent change**
Population (total individuals)	1,321,864		1,419,369		7.4%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	82.2%		86.2%		Difference = 4.0%
Poverty* (Number of families)	11,361		14,327		26.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	33,534	4.8%	27,964	3.9%	-16.6%

Table 675 - Population, education, poverty and unemployment statistics for Suffolk County, NY (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Suffolk County increased 7.4% from 1990 and 2000 (Table 675). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 82.2% in 1990 to 86.2% in 2000, a rise of 4 percentage points over the period. The number of families living in poverty increased 26%, while the number of unemployed decreased over 16% from 1990 to 2000. The unemployment rate increased from 4.8% of the labor force in 1990 to 3.9% in 2001.

Fishing Industry Employment in Eastern Long Island

Suffolk County

The number of fishing establishments in Suffolk County increased from 1997 to 1998, decreasing in the following two years (Table 676). The average payroll for fishing establishments was $33,874 in 2000. Fish and seafood wholesale establishments decreased from 53 in 1998 to 44 in 2000 and remained stable in 2001. Fish and seafood markets were relatively stable, averaging 33 over the time period. One establishment was reported from 1998 to 2001 for the seafood product preparation and packaging and fresh and frozen seafood processing sectors. No seafood canning establishments were reported in Suffolk County.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	841	970	942	895	NA
	Sum of Annual payroll	31,712	36,137	33,657	30,317	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	53	48	44	44
	Sum of Annual payroll	NA	5,883	5,992	5,636	6,015
44522** Fish and seafood markets	Sum of Total Establishments	NA	33	34	32	32
	Sum of Annual payroll	NA	not avail.	not avail.	not avail.	not avail.

Table 676 - Employment in fishing and related industries in Suffolk County, NY (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Eastern Long Island, NY

By Port of Landing

The number of active multispecies vessels increased from 100 in 1994 to 173 in 2000, decreasing to 149 in 2001 (Table 677). The number of vessels landing groundfish increased from 1994 to 1998, decreasing afterwards. Total landings and revenues rose from 1994 to 1998, decreasing in the following years. Groundfish landings generally rose, with peaks of over 1 million pounds in 1998 and 2000. Small mesh multispecies landings composed the majority of total landings in this region, with a four-fold increase from 1994 to 1998 followed by a 49% decrease from 1998 to 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	100	135	118	148	162	153	173	149
Number of Multispecies Vessels Landing Groundfish	60	66	64	82	86	77	72	59
TOTAL								
Landings	5,281.3	12,187.5	12,659.8	16,240.9	17,292.5	14,960.0	13,339.1	12,176.8
Revenues	$8,211.3	$12,166.6	$10,440.3	$12,446.5	$13,338.8	$12,450.7	$10,546.8	$10,362.1
GROUNDFISH								
Landings	207.2	484.3	435.5	697.5	1,128.6	841.0	1,055.2	652.2
Revenues	$265.7	$684.8	$556.4	$938.0	$1,388.6	$999.7	$1,064.7	$632.9
SMALL MESH MULTISPECIES								
Landings	2,111.5	5,237.2	6,726.1	7,028.2	8,985.5	5,279.9	4,582.4	4,603.7
Revenues	$1,147.8	$2,295.9	$3,156.1	$3,232.7	$3,918.4	$2,612.0	$2,481.5	$2,432.6
SMALL MESH NON-MULTISPECIES								
Landings	877.4	3,161.0	2,386.4	5,533.5	4,595.2	6,643.3	5,523.7	4,567.5
Revenues	$649.1	$1,633.9	$1,932.9	$4,008.9	$4,009.5	$5,183.6	$3,414.8	$3,338.3
OTHER SPECIES								
Landings	1,606.7	2,763.0	3,041.0	2,929.9	2,517.4	2,117.7	2,053.8	2,234.9
Revenues	$3,533.8	$5,416.7	$4,489.7	$4,075.9	$3,766.9	$3,365.9	$3,153.7	$3,633.3
HIGH VALUE SPECIES								
Landings	478.5	542.0	70.9	51.8	65.8	78.0	124.1	118.5
Revenues	$2,572.4	$2,058.1	$283.5	$173.0	$231.5	$289.6	$484.4	$471.6

Table 677 - Landings and Revenues from Multispecies Permit Holders in Eastern Long Island, NY (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The total number of permitted multispecies vessels generally declined, with a 15% decrease from 1994 to 2001 (Table 678). The number of active vessels increased over the period, as did the number of vessels landing groundfish, peaking at 104 in 1998. Total landings fluctuated between 1994 and 2001, with an overall positive trend across the period. Groundfish landings generally increased as well. Dependence on groundfish averaged just over 10% across the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	240	231	211	205	202	213	216	204
TOTAL								
Number Active*	103	130	117	138	152	146	153	142
Landings	10,563.8	20,363.9	19,678.6	24,234.9	26,996.3	24,433.6	25,893.2	23,323.2
Revenues	$11,166.9	$18,391.7	$15,649.6	$18,576.4	$20,988.8	$20,310.8	$20,592.9	$18,918.5
GROUNDFISH								
Number Active**	76	91	87	99	104	103	95	85
Landings	252.5	615.3	906.8	943.9	2,056.8	2,532.9	3,606.0	2,803.4
Revenues	$319.2	$861.5	$1,189.1	$1,264.7	$2,538.0	$2,885.6	$3,743.6	$2,823.7
Multispecies Revenues as a percent of Total Revenues	2.9%	4.7%	7.6%	6.8%	12.1%	14.2%	18.2%	14.9%

Table 678 - Fishing Activity for Vessels Homeported in Eastern Long Island
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases.

9.4.5.11.2 Other Long Island, NY

The Other Long Island, NY group is a secondary multispecies port group that includes Mattituck, Islip, Freeport, Brooklyn, Other Nassau County, and Other Suffolk County.

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of Mattituck, Islip, Freeport, Brooklyn, Other Nassau County, and Other Suffolk County communities. It also includes a general profile of the Long Island, New York sub-region. These profiles should be referenced for social and demographic data not contained in this document.

Nassau County	1990		2000		Percent change
Population (total individuals)	1,287,348		1,334,544		3.7%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	84.2%		86.7%		Difference = 4.0%
Poverty* (Number of families)	8,650		12,207		41.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	28,580	4.1%	24,175	3.7%	-15.4%

Table 679 - Population, education, poverty and unemployment statistics for Nassau County, NY (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Nassau County increased 3.7% from 1990 and 2000 (Table 679). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 84.2% in 1990 to 86.7% in 2000, a rise of 4 percentage points over the period. The number of families living in poverty increased 41%, while the number of unemployed decreased just over 15% from 1990 to 2000. The unemployment rate increased from 4.1% of the labor force in 1990 to 3.7% in 2001.

Queens County	**1990**		**2000**		**Percent change**
Population (total individuals)	1,951,598		2,229,379		14.2%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	71.1%		74.4%		Difference = 3.3%
Poverty* (Number of families)	41,138		64,468		56.7%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	76,752	7.6%	80,111	7.7%	4.4%

Table 680 - Population, education, poverty and unemployment statistics for Queens County, NY (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Queens County increased 14.2% from 1990 and 2000 (Table 680). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 71.1% in 1990 to 74.4% in 2000, a rise of 3.3 percentage points over the period. The number of families living in poverty increased substantially (56.7%), and the number of unemployed increased just over 4% from 1990 to 2000. The unemployment rate increased from 7.6% of the labor force in 1990 to 7.7% in 2001.

Kings County	**1990**		**2000**		**Percent change**
Population (total individuals)	2,300,664		2,465,326		7.2%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	63.7%		68.8%		Difference = 5.1%
Poverty* (Number of families)	109,811		129,694		18.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	106,664	10.3%	111,528	10.7%	4.6%

Table 681 - Population, education, poverty and unemployment statistics for Kings County, NY (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Kings County increased 7.2% from 1990 and 2000 (Table 681). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from

63.7% in 1990 to 68.8% in 2000, a rise of 5.1 percentage points over the period. Relative to other counties examined in this document, this educational attainment level is quite low. The number of families living in poverty increased 18%, and the number of unemployed increased 4.6% from 1990 to 2000. The unemployment rate increased from 10.3% of the labor force in 1990 to 10.7% in 2001.

Fishing Industry Employment in Other Long Island

Nassau County

The number of total fishing establishments increased from 124 in 1997 to 154 in 1999, decreasing slightly in 2000 (Table 682). The average payroll for fishing establishments was $41,993 in 2000. The number of fish and seafood wholesale establishments averaged 36 from 1998 to 2001, while fish and seafood markets averaged 34 during this period. There were two seafood product preparation and packaging and fresh and frozen seafood processing establishments in each year from 1998 to 2001.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	124	161	154	149	NA
	Sum of Annual payroll	5,123	5,244	6,056	6,257	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	37	35	35	38
	Sum of Annual payroll	NA	5,737	5,865	7,272	7,674
44522** Fish and seafood markets	Sum of Total Establishments	NA	30	33	34	38
	Sum of Annual payroll	NA	1,995	2,295	2,909	2,687

Table 682 - Employment in fishing and related industries in Nassau County, NY (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*

*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*

NAICS = North American Industry Classification System

***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*

***E** =reported as zero, may be in error or <$1,000*

***NA** = not applicable*

Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Queens County

The number of fishing establishments increased from 25 in 1997 to 31 in 2000, with an average payroll of $19,645 in 2000 (Table 683). Fish and seafood wholesale and fish and seafood markets remained fairly stable from 1998 to 2001, averaging 37 and 31, respectively. There were between 1 and 2 establishments reported in the seafood product preparation and packaging and fresh and frozen seafood processing sectors from 1998 to 2001 and no establishments reported in seafood canning.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	25	26	28	31	NA
	Sum of Annual payroll	469	446	784	609	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	2	2	1
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	2	2	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	38	35	40	35
	Sum of Annual payroll	NA	6,759	6,717	7,610	7,722
44522** Fish and seafood markets	Sum of Total Establishments	NA	30	30	32	32
	Sum of Annual payroll	NA	1,190	1,266	1,360	1,333

Table 683 - Employment in fishing and related industries in Queens County, NY (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Kings County

Fishing establishments remained stable from 1997 to 2000, with a peak of 42 in 1999 (Table 684). The average payroll for participants in the fishing sector was $31,811 in 2000. The number of fish and seafood markets (avg. 64) exceeded the number of fish and seafood wholesale establishments (avg. 47); both sectors remained relatively stable over the period from 1998 to 2001. All other establishments were reported in low numbers, declining slightly across the time period.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	38	38	42	37	NA
	Sum of Annual payroll	618	802	1,065	1,177	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	5	4	2	3
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	3	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	2	2	0	1
	Sum of Annual payroll	NA	E	E	0	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	49	49	45	43
	Sum of Annual payroll	NA	11,201	12,635	14,027	13,784
44522** Fish and seafood markets	Sum of Total Establishments	NA	60	58	67	71
	Sum of Annual payroll	NA	2,494	2,602	2,713	3,082

Table 684 - Employment in fishing and related industries in Kings County, NY (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Other Long Island

By Port of Landing

The number of active multispecies vessels landing fish in Other Long Island peaked at 84 in 1996 and declined afterwards (Table 685). Vessels landing groundfish declined by over 50% from 1994 to 2001. Total landings and revenues generally declined across the time period, averaging a 5% decline in landings each year. Groundfish landings increased from 1994 to 1997, dropping during the late-1990s and peaking in 2000 at 248,000 pounds. Small mesh non-multispecies made up the highest proportion of total landings of all species groups, fluctuating over the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	59	59	84	55	44	44	52	46
Number of Multispecies Vessels Landing Groundfish	36	31	41	29	18	13	15	17
TOTAL								
Landings	3,104.1	1,758.7	2,026.8	2,373.7	1,641.9	1,758.7	2,351.7	1,535.8
Revenues	$2,232.8	$1,344.3	$2,097.1	$1,866.5	$1,404.3	$1,402.3	$1,684.1	$1,374.8
GROUNDFISH								
Landings	79.2	74.7	117.1	135.4	76.9	99.4	248.4	152.7
Revenues	$92.7	$83.0	$153.4	$159.2	$87.1	$123.5	$235.8	$127.0
SMALL MESH MULTISPECIES								
Landings	731.0	314.1	578.6	638.4	633.5	495.3	346.5	121.3
Revenues	$412.8	$128.2	$307.7	$301.1	$279.5	$264.7	$176.8	$61.3
SMALL MESH NON-MULTISPECIES								
Landings	1,773.2	970.5	655.6	1,277.5	645.1	835.1	1,349.9	777.0
Revenues	$867.9	$522.3	$552.8	$933.5	$667.3	$665.9	$899.7	$540.1
OTHER SPECIES								
Landings	488.8	376.7	651.3	297.3	272.8	318.0	397.3	436.0
Revenues	$628.7	$479.6	$966.1	$373.3	$319.4	$313.2	$336.7	$482.8
HIGH VALUE SPECIES								
Landings	31.9	22.6	24.3	25.2	13.5	10.9	9.7	48.8
Revenues	$230.8	$131.3	$117.2	$99.4	$51.0	$35.0	$35.1	$163.6

Table 685 - Landings and Revenues from Multispecies Permit Holders in Other Long Island, NY (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The total number of permitted multispecies vessels declined by over 50% from 1994 to 2001 (Table 686). A small percentage of these vessels were active during this time period, decreasing from 23 in 1994 to 15 in 2001. Vessels landing groundfish declined from 1994 to 1996 and remained stable for the remainder of the period at around 9 vessels. Total landings fluctuated, and landings in 2001 were lower than 1994 landings. Groundfish landings increased at an average annual rise of nearly 30%. Groundfish dependence increased on average but exhibited a large decline from 32.2% in 2000 to 16.6% in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	92	88	62	49	44	41	45	43
TOTAL								
Number Active*	23	26	20	15	15	15	14	15
Landings	1,111.0	769.4	428.0	634.6	1,071.1	540.5	583.5	636.9
Revenues	$1,324.2	$796.3	$489.0	$651.7	$827.9	$552.2	$550.1	$694.9
GROUNDFISH								
Number Active**	12	13	7	9	9	9	9	10
Landings	68.5	31.1	86.3	97.7	165.0	130.7	181.4	143.1
Revenues	$90.3	$39.3	$114.8	$124.6	$191.1	$163.3	$177.0	$115.7
Multispecies Revenues as a percent of Total Revenues	6.8%	4.9%	23.5%	19.1%	23.1%	29.6%	32.2%	16.6%

Table 686 - Fishing Activity for Vessels Homeported in Other Long Island, NY
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases.

9.4.5.11.3 Other New York

All Other New York Counties
The number of fishing establishments increased from 1997 to 2000, reaching almost 400 by the last year in this period (Table 687). The average payroll for participants in the fishing sector was $19,645 in 2000. The number of fish and seafood wholesale establishments declined while fish and seafood markets increased from 1998 to 2001; in general, these sectors reported similar numbers of establishments during this period. Seafood product preparation and packaging establishments increased from 9 in 1998 to 14 in 2001. The fresh and frozen seafood processing sector was stable from 1998 to 2000, increasing to 9 establishments in 2001. The seafood canning sector reported between 4 and 5 establishments during these years.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	350	360	398	397	NA
	Sum of Annual payroll	5,288	6,432	7,300	7,799	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	9	10	11	14
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	4	4	5	5
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	5	6	6	9
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	146	146	141	136
	Sum of Annual payroll	NA	35,148	37,818	36,700	35,437
44522** Fish and seafood markets	Sum of Total Establishments	NA	149	142	142	150
	Sum of Annual payroll	NA	5,700	5,759	6,340	8,700

Table 687 - Employment in fishing and related industries in Other NY (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Other New York

By Port of Landing

The number of active multispecies vessels increased almost 54% from 1994 to 2001, while the number of vessels landing groundfish remained relatively stable over the period, averaging 53 (Table 688). Total landings increased from 3.5 million pounds in 1994 to 12 million pounds in 1998, decreasing afterwards to 8.5 million pounds in 2001. Groundfish landings generally increased from 1994 to 2001, with some fluctuation throughout this period. Landings of small mesh non-multispecies, which comprised a greater proportion of total landings than other species groups, fluctuated from 1994 to 2001 with a generally increasing trend.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	78	92	83	88	91	81	115	120
Number of Multispecies Vessels Landing Groundfish	42	59	58	52	55	48	54	55
TOTAL								
Landings	3,546.7	10,001.5	8,279.6	11,612.0	12,061.0	10,617.2	11,274.2	8,467.3
Revenues	$3,248.8	$7,244.2	$6,263.7	$8,878.3	$9,022.7	$7,874.3	$8,639.5	$6,952.7
GROUNDFISH								
Landings	51.8	152.3	524.8	389.1	592.1	531.2	745.5	502.7
Revenues	$59.8	$199.3	$693.8	$485.8	$708.6	$601.1	$728.4	$453.0
SMALL MESH MULTISPECIES								
Landings	1,688.0	4,576.8	3,677.2	3,740.4	4,669.6	2,457.0	1,941.4	1,408.1
Revenues	$1,009.6	$2,463.7	$2,009.9	$1,797.5	$2,048.2	$1,230.0	$1,032.3	$596.6
SMALL MESH NON-MULTISPECIES								
Landings	1,046.2	3,669.8	1,977.4	4,827.3	2,710.9	4,178.6	6,333.2	3,955.6
Revenues	$781.1	$2,238.2	$1,658.4	$3,768.4	$2,696.3	$3,231.2	$3,915.6	$2,957.3
OTHER SPECIES								
Landings	675.6	1,430.1	2,060.6	2,616.2	4,057.8	3,427.7	2,046.2	2,420.8
Revenues	$896.0	$1,513.1	$1,770.0	$2,696.2	$3,479.4	$2,703.4	$2,311.5	$2,579.6
HIGH VALUE SPECIES								
Landings	85.1	172.4	39.6	38.9	30.4	22.8	207.9	180.2
Revenues	$502.3	$829.9	$131.6	$130.4	$90.1	$108.7	$651.6	$366.1

Table 688 - Landings and Revenues from Multispecies Permit Holders in Other NY (Dealer Activity)
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

Permitted multispecies vessels declined in number from 1994 to 2001 while the number of active vessels including those landing groundfish remained relatively stable (Table 689). The percentage of active vessels out of the total number of permitted vessels was low throughout the period. Total landings generally declined, with a peak of 5.1 million pounds in 1997. Groundfish landings rose from 1994 to 1995, dropped in 1996 and rose again to 309,000 pounds in 2000. From 2000 to 2001 landings declined 60.4%. Dependence on groundfish fluctuated but remained low throughout the time period, peaking at 11.3% in 1996.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	194	169	152	146	123	130	130	117
TOTAL								
Number Active*	43	50	56	48	39	51	54	42
Landings	3,189.6	2,963.2	3,184.1	5,133.2	3,657.7	2,991.3	3,283.8	2,112.5
Revenues	$2,740.9	$2,851.6	$3,299.6	$4,256.2	$3,580.9	$2,706.3	$2,784.9	$2,037.1
GROUNDFISH								
Number Active**	22	22	29	27	21	16	19	21
Landings	35.4	150.1	330.1	327.2	223.0	252.5	308.8	122.4
Revenues	$36.6	$186.9	$371.7	$342.9	$252.8	$267.4	$286.7	$119.1
Multispecies Revenues as a percent of Total Revenues	1.3%	6.6%	11.3%	8.1%	7.1%	9.9%	10.3%	5.8%

Table 689 - Fishing Activity for Vessels Homeported in Other NY

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases.

9.4.5.12 New Jersery

Demographic Profile of New Jersey

NEW JERSEY	1990		2000		Percent change
Population (total individuals)	7,730,188		8,414,350		8.9%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	76.7%		82.1%		Difference = 5.4%
Poverty* (Number of families)	113,848		135,549		19.1%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	235,975	5.7%	243,116	5.8%	3.0%

Table 690 - Population, education, poverty and unemployment statistics for the state of New Jersey (1990 and 2000)

** data shown for 1989 and 1999*

Data source: U.S. Census Bureau

The total population in New York increased by 8.9% from 7.7 million in 1990 to 8.4 million in 2000 (Table 690). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 5.4% over the course of a decade, from 76.7% in 1990 to 82.1% in 2000. The number of families below the poverty level increased about 19% from 1989 to 1999 and the unemployment rate increased over the decade, from 5.7% to 5.8% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
NEW JERSEY	8,414,350	8,200,595	6,104,705	1,141,821	19,492	480,276	3,329	450,972	213,755	1,117,191
Selected Counties										
Atlantic County	**252,552**	**246,027**	**172,632**	**44,534**	**669**	**12,771**	**114**	**15,307**	**6,525**	**30,729**
Cape May County	**102,326**	**101,144**	**93,700**	**5,178**	**186**	**661**	**40**	**1,379**	**1,182**	**3,378**
Monmouth County	**615,301**	**604,990**	**519,261**	**49,609**	**879**	**24,403**	**153**	**10,685**	**10,311**	**38,175**
Ocean County	**510,916**	**504,347**	**475,391**	**15,268**	**702**	**6,550**	**103**	**6,333**	**6,569**	**25,638**

Table 691 - Population by race in selected New Jersey counties, 2000
Counties examined in Fishing Communities section of AHE in bold type.
Data source: U.S. Census Bureau

In 2000, the total population of New Jersey was 72.6% white, 13.6% black/African American, 5.7% Asian, 2.5% of two or more races, and over 5% other races (Table 691). Hispanics/Latinos of any race made up 13.3% of the population. Monmouth and Ocean counties, which make up the Northern Coastal NJ port group, each had populations of over 500,000. Monmouth County was 84.4% white, over 8% black/African American, 4% Asian, and each of the other racial groups comprising under 2% of the total. Ocean County is less racially diverse, with 93% whites, 3% blacks/African Americans, and all other racial groups combined making up less than 4% of the total. Atlantic and Cape May counties form the Southern Coastal NJ port group and have smaller populations than counties in the Northern group. Atlantic and Cape May counties are very different in the racial composition of their populations. Atlantic County is 68.4% white, 17.6% black/African American, over 5% Asian, and over 6% of other races, while Cape May County is almost 92% white, just over 5% black/African American, and under 1.5% of each of the other racial groups.

9.4.5.12.1 Northern Coastal NJ

The Northern Coastal NJ group is a secondary multispecies port group that includes Point Pleasant, Belford, Long Beach/Barnegat Light, Barnegat, Highlands, Belmar, Sea Bright, and Manasquan. These communities are located in Monmouth and Ocean counties.

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of Point Pleasant, Belford, Long Branch/Barnegat Light, Barnegat, Highlands, Belmar, Sea Bright, and Manasquan. It also includes a general profile of the Northern Coastal NJ sub-region. These profiles should be referenced for social and demographic data not contained in this document.

Monmouth County	1990		2000		Percent change
Population (total individuals)	553,124		615,301		11.2%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	82.8%		87.9%		Difference = 5.1%
Poverty* (Number of families)	5,057		7,311		44.6%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	15,078	5.2%	14,190	4.6%	-5.9%

Table 692 - Population, education, poverty and unemployment statistics for Monmouth County, NJ (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Monmouth County increased 11.2% from 1990 and 2000 (Table 692). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 82.8% in 1990 to 87.9% in 2000, a rise of 5.1 percentage points over the period. The number of families living in poverty increased 44.6%, while the number of unemployed decreased almost 6% from 1990 to 2000. The unemployment rate decreased from 5.2% of the labor force in 1990 to 4.6% in 2001.

Ocean County	1990		2000		Percent change
Population (total individuals)	433,203		510,916		17.9%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	74.9%		83.0%		Difference = 8.1%
Poverty* (Number of families)	5,170		6,631		28.3%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	11,344	5.9%	11,615	5.2%	2.4%

Table 693 - Population, education, poverty and unemployment statistics for Ocean County, NJ (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Ocean County increased 17.9% from 1990 and 2000 (Table 693). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 74.9% in 1990 to 83% in 2000, a rise of 8.1 percentage points over the period. The number of families living in poverty increased 28.3% over the period. Although the number of unemployed increased 2.4% from 1990 to 2000, the unemployment rate decreased, from 5.9% of the labor force in 1990 to 5.2% in 2001.

Fishing Industry Employment in Monmouth County

Monmouth County

The number of total fishing establishments in Monmouth County remained relatively stable from 1997 to 2000, except for a peak of 172 in 1998 (Table 694). The average payroll for fishing sector participants was $53,127 in 2000. Fish and seafood wholesale and fish and seafood markets sectors remained relatively constant from 1998 to 2001, averaging 9 and 11, respectively. No establishments were reported for the fresh and frozen seafood processing, seafood product preparation and packaging and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	163	172	165	166	NA
	Sum of Annual payroll	6,350	8,383	8,531	8,819	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	9	9	8	9
	Sum of Annual payroll	NA	1,891	2,183	1,785	2,217
44522** Fish and seafood markets	Sum of Total Establishments	NA	10	12	12	10
	Sum of Annual payroll	NA	E	E	E	1,208

Table 694 - Employment in fishing and related industries in Monmouth County, NJ (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Ocean County

The number of fishing establishments declined from 1997 to 2000 but was greater in Ocean County than in Monmouth County in every year of the period (Table 695). The average payroll for fishing sector participants was $69,882 in 2000. Fish and seafood wholesale sector reported an average of 7 establishments from 1998 to 2001, while fish and seafood markets numbered 9 on average. Two establishments were reported for seafood product preparation and packaging and fresh and frozen seafood processing sectors in each year from 1998 to 2001. No seafood canning establishments were reported during this period.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	345	394	302	314	NA
	Sum of Annual payroll	40,677	50,579	24,226	21,943	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	6	7	7	6
	Sum of Annual payroll	NA	1,850	1,887	2,147	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	8	10	8	9
	Sum of Annual payroll	NA	509	520	566	655

Table 695 - Employment in fishing and related industries in Ocean County, NJ (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Northern Coastal NJ

By Port of Landing

The number of active multispecies vessels was relatively stable from 1994 to 2001, with some decline towards the end of the period (Table 696). The number of vessels reporting groundfish landings declined from 26 in 1994 to 15 in 2001. Total landings decreased 65.5%, from 10.3 million pounds in 1994 to 3.6 million pounds in 2001. Groundfish landings were stable from 1994 to 1995, declining in the following two years and increasing to a maximum of 470,000 pounds in 2000. Landings of other species composed the greatest percentage of the total from 1994 to 2001 but declined over the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	34	38	36	36	38	40	32	29
Number of Multispecies Vessels Landing Groundfish	26	27	27	19	17	16	13	15
TOTAL								
Landings	10,371.3	9,407.3	10,439.2	9,750.3	7,008.6	5,774.7	2,690.1	3,577.6
Revenues	$4,285.2	$2,984.8	$2,300.6	$2,701.4	$2,834.7	$3,123.8	$2,194.3	$2,079.0
GROUNDFISH								
Landings	294.6	291.5	201.7	95.7	173.9	431.3	470.1	360.5
Revenues	$392.9	$387.0	$265.6	$140.1	$172.8	$413.7	$417.1	$296.3
SMALL MESH MULTISPECIES								
Landings	749.4	389.5	301.0	855.8	206.5	256.9	184.4	169.1
Revenues	$401.1	$201.3	$152.7	$399.5	$112.5	$119.0	$90.7	$65.4
SMALL MESH NON-MULTISPECIES								
Landings	414.0	693.0	187.8	418.1	300.2	288.8	307.5	405.1
Revenues	$284.2	$374.5	$161.5	$312.1	$282.6	$169.2	$214.5	$259.4
OTHER SPECIES								
Landings	8,865.1	7,972.1	9,658.0	8,226.1	6,104.8	4,516.9	1,596.7	2,491.5
Revenues	$3,023.9	$1,772.8	$1,401.8	$1,264.1	$1,507.5	$1,353.2	$913.9	$868.0
HIGH VALUE SPECIES								
Landings	48.3	61.2	90.8	154.5	223.3	280.9	131.5	151.4
Revenues	$183.1	$249.2	$319.0	$585.7	$759.3	$1,068.7	$558.1	$589.9

Table 696 - Landings and Revenues from Multispecies Permit Holders in Nothern Coastal NJ (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bl uefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels declined through the late-1990s, increasing afterwards to a peak of 176 vessels in 2001 (Table 697). The number of active vessels increased from 78 in 1994 to 86 in 1996, stabilizing at 84 in 1997-1998, and increasing to 104 from 1999-2001. Vessels reporting landings of groundfish declined from 55 in 1994 to 39 in 2001. Total landings increased about 32% from 1994 to 1997, declining 38% from 1997 to 2001. Groundfish landings fluctuated across the period, with a low of 215,000 pounds in 1997 and a high of 836,000 pounds in 1996. Groundfish dependence was low throughout the period, averaging 3.8%.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	171	172	162	157	144	163	166	176
TOTAL								
Number Active*	78	83	86	84	84	104	104	104
Landings	18,475.6	18,584.4	19,299.5	24,381.4	17,909.5	20,968.8	14,664.7	15,064.5
Revenues	$15,913.9	$13,733.2	$13,605.2	$14,731.1	$14,598.0	$22,893.7	$21,904.2	$20,403.2
GROUNDFISH								
Number Active**	55	53	54	44	43	47	38	39
Landings	517.8	504.5	835.9	215.1	429.8	749.8	823.0	567.8
Revenues	$644.8	$659.1	$997.6	$309.0	$491.3	$744.5	$753.9	$474.6
Multispecies Revenues as a percent of Total Revenues	4.1%	4.8%	7.3%	2.1%	3.4%	3.3%	3.4%	2.3%

Table 697 - Fishing Activity for Vessels Homeported in Northern Coastal NJ
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases.

9.4.5.12.2 Southern Coastal NJ

The Southern Coastal NJ group is a secondary multispecies port group that includes Cape May, Wildwood, Burleigh, Sea Isle City, Ocean City, Stone Harbor, and Avalon. These communities are located in Atlantic and Cape May counties.

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of Cape May, Wildwood, Burleigh, Sea Isle City, Ocean City, Stone Harbor, and Avalon. It also includes a general profile of the Southern Coastal NJ sub-region. These profiles should be referenced for social and demographic data not contained in this document.

Atlantic County	1990		2000		Percent change
Population (total individuals)	224,327		252,552		12.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	72.9%		78.2%		Difference = 5.3%
Poverty* (Number of families)	3,686		4,810		30.5%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	6,672	5.5%	9,405	7.5%	41.0%

Table 698 - Population, education, poverty and unemployment statistics for Atlantic County, NJ (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Atlantic County increased 12.6% from 1990 and 2000 (Table 698). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 72.9% in 1990 to 78.2% in 2000, a rise of 5.3 percentage points over the period. The number of families living in poverty increased 30.5%, and the number of unemployed increased 41% from 1990 to 2000. The unemployment rate increased from 5.5% of the labor force in 1990 to 7.5% in 2001.

Cape May County	**1990**		**2000**		**Percent change**
Population (total individuals)	95,089		102,326		7.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	74.0%		81.9%		Difference = 7.9%
Poverty* (Number of families)	1,528		1,747		14.3%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	3,328	7.5%	3,979	8.2%	19.6%

Table 699 - Population, education, poverty and unemployment statistics for Cape May County, NJ (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Cape May County increased 7.6% from 1990 and 2000 (Table 699). The percent of individuals ages 25 and older who graduated from high school or a higher secondary school increased from 74% in 1990 to 81.9% in 2000, a rise of 7.9 percentage points over the period. The number of families living in poverty increased 14.3%, and the number of unemployed increased 19.6% from 1990 to 2000. The unemployment rate increased from 7.5% of the labor force in 1990 to 8.2% in 2001.

Atlantic County
The number of fishing establishments increased from 99 in 1997 to 115 in 1998, falling to 108 in 1999 and remaining stable in the following year (Table 700). The average payroll for participants in the fishing sector was $42,972 in 2000. The number of fish and seafood wholesale establishments averaged 6 from 1998 to 2001, while the number of fish and seafood markets remained stable, at around 2 establishments in each year throughout the period. No establishments were reported in the fresh and frozen seafood processing, seafood product preparation and packaging and seafood canning sectors.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	99	115	108	108	NA
	Sum of Annual payroll	4,604	4,302	4,187	4,641	NA
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	5	7	7	6
	Sum of Annual payroll	NA	901	1,143	1,266	1,226
44522** Fish and seafood markets	Sum of Total Establishments	NA	2	2	1	2
	Sum of Annual payroll	NA	E	E	E	E

Table 700 - Employment in fishing and related industries in Atlantic County, NJ (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*
NAICS = North American Industry Classification System
D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Cape May County

The number of fishing establishments generally declined from 1997 to 2000, this number higher than that in Atlantic County (Table 701). All other establishments were represented in low numbers but remained very stable from 1998 to 2001.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	336	349	302	329	NA
	Sum of Annual payroll	31,888	31,410	31,300	34,315	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	2	2	2	2
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	6	6	6	6
	Sum of Annual payroll	NA	3,288	3,278	3,013	3,122
44522** Fish and seafood markets	Sum of Total Establishments	NA	14	13	14	14
	Sum of Annual payroll	NA	1,096	1,032	1,171	1,298

Table 701 - Employment in fishing and related industries in Cape May County, NJ (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Southern Coastal NJ

By Port of Landing

The number of active multispecies vessels in Southern Coastal NJ generally declined from 1994 to 2001, with some fluctuation throughout the period (Table 702). Vessels landing groundfish declined 68% from 1994 to 2001. Total landings fluctuated from 1994 to 2001, averaging 6.2 million pounds over the period with a peak of 81.2 million pounds in 1998 and a low point of 49.8 million pounds in 1999. Small mesh non-multispecies and other species comprised the overwhelming majority of total landings, while groundfish made up the smallest percentage. Groundfish landings decreased, from 15,800 pounds in 1994 to 4,800 pounds in 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	182	162	144	127	137	115	133	150
Number of Multispecies Vessels Landing Groundfish	41	34	33	36	32	37	21	13
TOTAL								
Landings	61,746.5	70,091.6	57,207.2	64,348.4	81,234.8	49,777.1	60,669.7	53,466.3
Revenues	$29,431.3	$27,354.6	$25,789.4	$24,191.5	$22,878.0	$20,354.0	$23,488.0	$26,389.4
GROUNDFISH								
Landings	15.8	10.2	16.1	16.5	20.4	13.6	12.8	4.8
Revenues	$14.4	$9.5	$7.8	$9.3	$15.5	$8.4	$9.0	$2.2
SMALL MESH MULTISPECIES								
Landings	136.8	112.6	355.2	182.0	69.6	29.2	74.6	25.5
Revenues	$43.1	$40.8	$144.7	$45.6	$22.7	$9.4	$20.6	$3.8
SMALL MESH NON-MULTISPECIES								
Landings	32,628.5	37,737.0	26,849.0	41,820.3	57,802.6	25,801.9	38,811.5	27,077.3
Revenues	$11,535.6	$11,384.1	$8,644.9	$12,631.1	$11,303.0	$6,382.3	$5,257.3	$4,267.6
OTHER SPECIES								
Landings	27,048.5	30,739.4	28,448.1	21,288.4	22,127.7	22,145.3	18,458.5	20,689.2
Revenues	$8,407.3	$8,397.3	$8,554.4	$5,228.8	$4,993.9	$5,292.5	$3,595.0	$3,492.5
HIGH VALUE SPECIES								
Landings	1,917.0	1,492.5	1,538.8	1,041.3	1,214.5	1,787.0	3,312.3	5,669.5
Revenues	$9,430.8	$7,523.0	$8,437.5	$6,276.7	$6,542.9	$8,661.4	$14,606.0	$18,623.3

Table 702 - Landings and Revenues from Multispecies Permit Holders in Southern Coastal NJ (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels decreased through the late-1990s, increasing in 2000 and 2001 to levels comparable to those in the first years of the time period (Table 703). The number of active multispecies vessels remained relatively stable over the time period, with a peak of 79 vessels in 2000. Vessels landing groundfish declined in number, dropping nearly 52% across the period. Dependence on groundfish was the lowest of any other port group in New England and the mid-Atlantic states, averaging less than 1% from 1994 to 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	136	128	122	123	116	117	128	130
TOTAL								
Number Active*	70	65	67	68	70	74	79	75
Landings	63,362.0	66,102.1	54,619.8	55,955.3	86,513.4	57,616.2	69,917.0	76,930.2
Revenues	$30,685.2	$26,109.5	$24,674.0	$25,546.4	$25,381.3	$26,371.7	$30,322.9	$28,552.6
GROUNDFISH								
Number Active**	27	25	26	30	33	39	35	13
Landings	20.5	11.9	28.3	28.8	309.2	426.9	717.0	326.6
Revenues	$18.2	$10.5	$26.5	$24.2	$368.2	$516.5	$678.5	$245.5
Multispecies Revenues as a percent of Total Revenues	0.1%	0.0%	0.1%	0.1%	1.5%	2.0%	2.2%	0.9%

Table 703 - Fishing Activity for Vessels Homeported in Southern Coastal NJ
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases.

9.4.5.12.3 Other New Jersey

All Other Counties
The number of fishing establishments in other NJ counties remained relatively stable from 1997 to 2000, with an average payroll of $28,142 in 2000 (Table 704). The number of fish and seafood wholesale establishments and fish and seafood markets increased slightly from 1998 to 2001, averaging 80 and 88, respectively. The seafood product preparation and packaging sector reported from 10 to 14 establishments in each year, while the seafood canning and fresh and frozen seafood processing sectors reported 5 to 8 establishments during this period.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	259	252	246	260	NA
	Sum of Annual payroll	8,215	8,456	7,260	7,317	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	10	14	12	14
	Sum of Annual payroll	NA	4,823	5,420	6,483	6,547
311711** Seafood canning	Sum of Total Establishments	NA	5	7	7	6
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	5	7	5	8
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	75	81	79	85
	Sum of Annual payroll	NA	22,570	22,982	27,074	25,516
44522** Fish and seafood markets	Sum of Total Establishments	NA	84	86	90	90
	Sum of Annual payroll	NA	3,941	4,058	5,192	5,294

Table 704 - Employment in fishing and related industries in Other NJ (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Other New Jersey

By Port of Landing

The number of active multispecies vessels increased from 130 in 1994 to 163 in 2000, decreasing to some extent in 2001 (Table 705). Vessels landing groundfish also declined, and a smaller pecentage of active vessels landed groundfish in 2000 than in 1994. Total landings declined 42% from 1994 to 1996, increasing 20% from 1996 to 2001. Other species accounted for the bulk of total landings. Groundfish landings fluctuated across the period, composing a small percentage of total landings in each year.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	130	129	132	130	138	147	163	146
Number of Multispecies Vessels Landing Groundfish	51	44	40	36	36	43	34	29
TOTAL								
Landings	31,019.4	19,849.4	18,130.4	19,684.3	19,719.4	23,840.3	24,336.1	21,768.5
Revenues	$22,257.1	$16,414.7	$15,793.3	$16,245.2	$15,434.4	$23,244.2	$23,951.2	$22,007.4
GROUNDFISH								
Landings	58.3	235.6	440.5	97.1	320.9	295.1	373.8	232.0
Revenues	$51.8	$295.4	$617.5	$149.6	$395.9	$314.1	$342.5	$200.1
SMALL MESH MULTISPECIES								
Landings	1,783.0	2,528.1	1,355.5	1,492.7	963.6	718.7	940.2	672.4
Revenues	$849.3	$1,122.8	$483.5	$555.9	$347.6	$271.9	$392.8	$267.2
SMALL MESH NON-MULTISPECIES								
Landings	7,109.0	5,058.2	4,121.2	5,996.4	2,380.0	2,302.2	2,449.6	2,338.1
Revenues	$3,674.6	$2,608.2	$1,891.8	$3,014.2	$1,579.7	$1,445.4	$1,284.1	$1,418.2
OTHER SPECIES								
Landings	20,566.3	10,643.3	11,102.2	10,914.0	14,967.6	18,585.2	17,875.6	15,685.3
Revenues	$10,563.1	$6,593.1	$6,755.9	$6,147.9	$7,628.3	$11,924.2	$9,449.7	$9,598.3
HIGH VALUE SPECIES								
Landings	1,502.7	1,384.1	1,111.0	1,184.2	1,087.3	1,939.1	2,697.0	2,840.7
Revenues	$7,118.4	$5,795.2	$6,044.6	$6,377.5	$5,483.0	$9,288.6	$12,482.1	$10,523.6

Table 705 - Landings and Revenues from Multispecies Permit Holders in Other NJ (Dealer Activity)
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.
Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.
Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.
Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.
High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.
C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**
Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted vessels homeported in Other NJ declined from 180 in 1994 to 105 in 1998, increasing slightly afterwards (Table 706). The number of active groundfish vessels remained relatively consistent across the period, with those landing groundfish making up a small fraction of total permitted vessels. Vessels landing groundfish declined in number from 1994 to 2001 as well. Total landings declined an average of around 14% each year throughout the period. Groundfish landings increased approximately 5% from 1994 to 2001 but remained very low throughout the period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	180	184	134	113	105	115	117	117
TOTAL								
Number Active*	34	30	26	28	29	29	33	29
Landings	11,355.6	9,798.2	5,923.0	5,499.4	2,735.3	3,293.6	3,275.2	2,976.6
Revenues	$5,851.1	$5,193.9	$2,899.7	$2,979.3	$2,080.9	$2,726.4	$3,014.9	$2,642.4
GROUNDFISH								
Number Active**	10	7	6	6	4	8	11	6
Landings	34.2	34.8	60.7	102.0	212.7	198.5	304.1	200.6
Revenues	$38.4	$44.4	$94.5	$95.3	$251.8	$251.7	$269.6	$194.6
Multispecies Revenues as a percent of Total Revenues	0.7%	0.9%	3.3%	3.2%	12.1%	9.2%	8.9%	7.4%

Table 706 - Fishing Activity for Vessels Homeported in Other NJ
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases.

9.4.5.13 Delaware

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of fishing ports in the state of Delaware. This includes the ports of Lewes, Indian River, Port Mahon, Bowers Beach and Mispillion. These profiles should be referenced for social and demographic data not contained in this document.

Detailed data at the trip and individual-vessel level for DE ports are not available for use in this draft amendment. In turn, the assessment of fishing activity and multispecies fishery dependence for communities in DE is not available at this time. Council staff will provide this information for the final Amendment 13 document if it can be made available. For this document, state-level and homeport state data for DE are presented in the section describing the commercial harvesting sector.

DELAWARE	1990		2000		Percent change
Population (total individuals)	666,168		783,600		17.6%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	77.5%		82.6%		Difference = 5.1%
Poverty* (Number of families)	10,851		13,306		22.6%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	13,945	4.0%	20,549	5.2%	47.4%

Table 707 - Population, education, poverty and unemployment statistics for the state of Delaware (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Delaware increased by 17.6% from 1990 to 2000 (Table 707). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 5.1 percentage points over the course of a decade, from 77.5% in 1990 to 82.6% in 2000. The number of families below the poverty level increased nearly 23% from 1989 to 1999 and the unemployment rate increased over the decade, from 4% to 5.2% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
DELAWARE	783,600	770,567	584,773	150,666	2,731	16,259	283	15,855	13,033	37,277

Table 708 - Population by race in Delaware, 2000
Counties examined in Fishing Communities section of AHE in bold type.
Data source: U.S. Census Bureau

In 2000, the total population of Delaware was 74.6% white, 19.2% black/African American, 2.1% Asian, 1.7% of two or more races, 2% other races, and 4.8% Hispanic/Latino of any race (Table 708).

Fishing Industry Employment in Delaware

The number of total establishments increased slightly from 1997 to 2000, remaining relatively stable during the latter three years of this period (Table 709). The average payroll for participants in the fishing sector was $44,253 in 2000. Fish and seafood markets averaged 12 in number from 1998 to 2001. Seven fish and seafood wholesale establishments were reported in 1998, this number dropping to 5 in 2001. The seafood product preparation and packaging and seafood canning sectors reported one establishment in every year from 1998 to 2001.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	196	224	224	221	NA
	Sum of Annual payroll	8,082	9,961	10,510	9,780	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
311711** Seafood canning	Sum of Total Establishments	NA	1	1	1	1
	Sum of Annual payroll	NA	E	E	E	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	7	5	4	5
	Sum of Annual payroll	NA	437	E	E	E
44522** Fish and seafood markets	Sum of Total Establishments	NA	11	11	13	12
	Sum of Annual payroll	NA	1,061	877	1,036	992

Table 709 - Employment in fishing and related industries in Delaware (1997-2001)
** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System

***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

9.4.5.14 Maryland

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of fishing ports in the state of Maryland. This includes the ports of Ocean City in Worcester County and Crisfield in Somerset County. These profiles should be referenced for social and demographic data not contained in this document.

MARYLAND	1990		2000		Percent change
Population (total individuals)	4,781,468		5,296,486		10.8%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	78.4%		83.8%		Difference = 5.4%
Poverty* (Number of families)	75,313		83,232		10.5%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	111,536	4.3%	128,902	4.7%	15.6%

Table 710 - Population, education, poverty and unemployment statistics for the state of Maryland (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Maryland increased by 10.8% from 1990 to 2000 (Table 710). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 5.4 percentage points over the course of a decade, from 78.4% in 1990 to 83.8% in 2000. The number of families below the poverty level increased 10.5% from 1989 to 1999 and the unemployment rate increased over the decade, from 4.3% to 4.7% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
MARYLAND	5,296,486	5,192,899	3,391,308	1,477,411	15,423	210,929	2,303	95,525	103,587	227,916

Table 711 - Population by race in Maryland, 2000
Counties examined in Fishing Communities section of AHE in bold type.
Data source: U.S. Census Bureau

In 2000, the total population of Maryland was 64% white, 27.9% black/African American, 4% Asian, 2% of two or more races, 1.8% other races, and 4.3% Hispanic/Latino of any race (Table 711).

Fishing Industry Employment in Maryland

The number of fishing establishments in Maryland remained relatively stable from 1997 to 2001, averaging 2,059 during this period (Table 712). The annual payroll for fishing sector participants averaged $25,289 in

2000. Other sectors also remained very stable from 1998 to 2001, with an average of 93 establishments in the fish and seafood wholesale sector, 70 fish and seafood markets, 27 establishments in seafood product preparation and packaging, 24 fresh and frozen seafood processing establishments, and 3 seafood canning establishments.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	2,042	2,057	2,089	2,048	NA
	Sum of Annual payroll	51,220	53,364	52,252	51,792	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	28	27	27	26
	Sum of Annual payroll	NA	12,975	12,668	12,793	14,812
311711** Seafood canning	Sum of Total Establishments	NA	2	2	3	4
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	26	25	24	22
	Sum of Annual payroll	NA	E	E	E	1,438
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	94	93	92	94
	Sum of Annual payroll	NA	15,858	15,593	16,308	16,994
44522** Fish and seafood markets	Sum of Total Establishments	NA	65	65	71	78
	Sum of Annual payroll	NA	5,645	6,188	7,224	7,097

Table 712 - Employment in fishing and related industries in Maryland (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*

*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*

NAICS = North American Industry Classification System

***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*

***E** =reported as zero, may be in error or <$1,000*

***NA** = not applicable*

Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Maryland

By Port of Landing

The number of active multispecies declined approximately 60% from 1994 to 2001, as did the number of multispecies vessels landing groundfish (Table 713). Multispecies vessels reporting groundfish landings were few in number during each year of the time period, with a maximum of 36 vessels in 1995 and minimum of 7 in 1999-2001. Total landings increased 87% from 1994 to 1995, declining afterwards to a low of 2.3 million pounds in 2001. Groundfish landings composed the smallest percentage of total landings and declined from 1,400 pounds in 1994 to only 200 pounds in 2001. Landings of other species made up the majority of total landings.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	58	80	54	39	36	27	27	23
Number of Multispecies Vessels Landing Groundfish	17	36	18	9	10	7	7	7
TOTAL								
Landings	4,651.1	8,716.2	5,778.2	4,723.9	3,873.4	2,862.8	3,360.6	2,340.1
Revenues	$2,969.3	$3,592.2	$2,671.5	$2,535.0	$2,342.9	$1,989.0	$2,643.5	$1,659.2
GROUNDFISH								
Landings	1.4	2.2	1.9	0.4	0.8	0.3	0.7	0.2
Revenues	$1.0	$1.7	$1.7	$0.3	$0.7	$0.3	$0.7	$0.1
SMALL MESH MULTISPECIES								
Landings	10.0	7.4	4.5	9.8	2.3	4.4	2.5	2.0
Revenues	$1.7	$2.6	$1.4	$1.8	$0.4	$0.6	$0.6	$0.5
SMALL MESH NON-MULTISPECIES								
Landings	101.3	240.8	84.0	340.0	101.8	183.5	172.5	55.4
Revenues	$30.9	$82.6	$50.6	$138.9	$52.7	$95.8	$91.5	$37.4
OTHER SPECIES								
Landings	4,462.7	8,361.2	5,647.3	4,286.9	3,716.6	2,658.4	3,115.7	2,255.2
Revenues	$2,710.7	$3,187.2	$2,476.7	$2,136.0	$2,121.3	$1,824.6	$2,280.5	$1,532.1
HIGH VALUE SPECIES								
Landings	75.8	104.6	40.6	86.8	52.0	16.3	69.2	27.3
Revenues	$225.0	$318.0	$141.1	$258.0	$167.7	$67.8	$270.2	$89.1

Table 713 - Landings and Revenues from Multispecies Permit Holders in Maryland (Dealer Activity)
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.
Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.
Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.
Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.
High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.
C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**
Data source: NMFS Permit and Dealer databases

By Homeport

The number of multispecies vessels permitted in Maryland increased from 8 in 1994 to 27 in 2001 (Table 714). Active vessels and those landing groundfish also increased but reported low numbers of vessels throughout the time period. Total landings more than quadrupled from 1994 to 1997, declining over 43% from 1997 to 2001. Groundfish landings were very low from 1994 to 2001 and fluctuated, with a small increase during the later years of the time period. As a percentage of total revenues, groundfish revenues in Maryland are almost insignificant, below 0.5% in all years.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	8	9	12	18	19	18	24	27
TOTAL								
Number Active*	6	7	9	15	15	14	17	18
Landings	569.0	857.9	1,310.2	2,365.6	2,084.5	1,740.9	1,469.4	1,337.6
Revenues	$701.4	$853.5	$955.2	$1,560.4	$1,429.9	$1,355.6	$1,558.4	$1,207.8
GROUNDFISH								
Number Active**	2	2	3	4	6	5	8	7
Landings	0.3	0.3	1.0	0.3	0.6	0.3	3.8	2.1
Revenues	$0.2	$0.2	$0.8	$0.3	$0.5	$0.2	$4.2	$2.4
Multispecies Revenues as a percent of Total Revenues	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.3%	0.2%

Table 714 - Fishing Activity for Vessels Homeported in Maryland
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
** Denotes the number of permitted multispecies vessels reporting landings of any species.*
*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*
***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*
Data source: NMFS Permit and Dealer databases.

9.4.5.15 Virginia

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of fishing ports in the state of Virginia. This includes ports of Norfolk, Hampton, Newport News, Virginia Beach, Lynnhaven, Seaford, Williamsburg, and Chincoteague, Wachapreague, Cape Charles, and Oyster. These profiles should be referenced for social and demographic data not contained in this document.

VIRGINIA	1990		2000		Percent change
Population (total individuals)	6,187,358		7,078,515		14.4%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	75.2%		81.5%		Difference = 6.3%
Poverty* (Number of families)	126,897		129,890		2.4%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	142,048	4.5%	151,125	4.2%	6.4%

Table 715 - Population, education, poverty and unemployment statistics for the state of Virginia (1990 and 2000)
** data shown for 1989 and 1999*
Data source: U.S. Census Bureau

The total population in Virginia increased by 14.4% from 1990 to 2000 (Table 715). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 6.3 percentage points over the course of a decade, from 75.2% in 1990 to 81.5% in 2000. The number of families below the poverty level increased 2.4% from 1989 to 1999. While the number of unemployed increased 6.4% over the decade, the unemployment rate decreased, from 4.5% to 4.2% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race									
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
VIRGINIA	7,078,515	6,935,446	5,120,110	1,390,293	21,172	261,025	3,946	138,900	143,069	329,540

Table 716 - Population by race in Virginia, 2000

Counties examined in Fishing Communities section of AHE in bold type.

Data source: U.S. Census Bureau

In 2000, the total population of Virginia was 72.3% white, 19.6% black/African American, 3.7% Asian, 2% of two or more races, 2% other races, and 4.7% Hispanic/Latino of any race (Table 716).

Fishing Industry Employment in Virginia

The number of fishing establishments in Virginia declined from 1997 to 2000, with an average payroll of $39,260 in 2000 (Table 717). The second greatest number of establishments was reported in the fish and seafood wholesale sector, which declined from 108 in 1998 to 100 in 2001. The number of fish and seafood markets increased slightly from 1998 to 2001, while fresh and frozen seafood processing and seafood product preparation and packaging establishments declined in number over this period. Seafood canning establishments remained stable over the period, ranging from 3 to 4.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	2,035	2,050	1,997	1,960	NA
	Sum of Annual payroll	68,748	69,540	71,413	76,949	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	46	42	41	42
	Sum of Annual payroll	NA	3,344	3,450	3,694	3,784
311711** Seafood canning	Sum of Total Establishments	NA	3	3	4	4
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	43	39	37	38
	Sum of Annual payroll	NA	3,344	3,450	3,694	3,784
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	108	108	105	100
	Sum of Annual payroll	NA	8,160	11,385	16,383	9,014
44522** Fish and seafood markets	Sum of Total Establishments	NA	53	52	57	59
	Sum of Annual payroll	NA	1,983	2,267	2,009	2,142

Table 717 - Employment in fishing and related industries in Virginia (1997-2001)

** from Nonemployer Statistics database*

*** from County Business Patterns database*

Annual payroll reported in thousands of dollars, ***not*** *adjusted for inflation.*

NAICS = North American Industry Classification System

D *= withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
E *=reported as zero, may be in error or <$1,000*
NA *= not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in Virginia

By Port of Landing

The number of active multispecies vessels declined from 183 in 1994 to 122 in 1997, increasing in the following years to 157 in 2000 (Table 718). The number of multispecies vessels landing groundfish declined 79% from 1994 to 2001. Total landings declined slightly through the mid-1990s and increased afterwards, reaching a maximum of 16.5 million pounds in 2001. Groundfish landings declined throughout the period, with a 94% drop from 1994 to 2001. Landings of other species and high value species composed the bulk of total landings. While other species landings remained stable throughout the period, high value species landings more than doubled between 1994 and 2001.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	183	141	134	122	147	141	153	157
Number of Multispecies Vessels Landing Groundfish	62	46	23	18	22	11	9	13
TOTAL								
Landings	10,272.5	10,511.6	9,326.3	8,597.3	11,850.8	11,078.2	13,648.3	16,496.0
Revenues	$26,427.9	$22,344.3	$21,746.3	$19,095.8	$20,769.3	$25,165.5	$37,203.3	$40,800.3
GROUNDFISH								
Landings	30.5	21.4	2.2	7.9	3.6	0.9	2.0	1.9
Revenues	$24.1	$21.9	$1.7	$12.9	$3.5	$0.8	$3.0	$0.6
SMALL MESH MULTISPECIES								
Landings	9.3	6.5	6.9	17.4	4.5	0.8	6.7	0.6
Revenues	$3.8	$2.6	$2.5	$5.2	$1.3	$0.2	$2.2	$0.2
SMALL MESH NON-MULTISPECIES								
Landings	1,845.4	2,450.0	2,496.0	1,502.3	1,746.8	727.4	1,165.5	556.8
Revenues	$315.5	$402.4	$291.8	$286.4	$468.5	$191.2	$382.9	$201.3
OTHER SPECIES								
Landings	4,111.5	4,702.9	3,581.9	4,688.1	7,303.0	6,107.7	4,908.9	4,834.4
Revenues	$5,383.2	$4,492.1	$3,529.3	$3,923.9	$4,931.7	$4,843.5	$3,632.6	$4,117.4
HIGH VALUE SPECIES								
Landings	4,275.8	3,330.8	3,239.4	2,381.7	2,792.8	4,241.4	7,565.1	11,102.3
Revenues	$20,701.3	$17,425.4	$17,921.0	$14,867.4	$15,364.3	$20,129.9	$33,182.6	$36,480.9

Table 718 - Landings and Revenues from Multispecies Permit Holders in Virginia (Dealer Activity)
Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.
Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.
Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.
Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.
Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.
High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.
C (“confidential”) **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**
Data source: NMFS Permit and Dealer databases

By Homeport

Total permitted multispecies vessels increased in number over the period, while number of active vessels remained stable (Table 719). Vessels landing groundfish declined from 1994 to 2001, numbering only 9 in 2001. Total landings were relatively consistent from 1994 to 1997, generally increasing in the following years. Groundfish landings increased substantially (23-fold), though remained low relative to total landings throughout the period. Dependence on groundfish remained low, increasing only slightly in the final two years of the time period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	108	112	98	107	110	128	129	124
TOTAL								
Number Active*	72	70	73	71	76	84	78	73
Landings	7,233.6	7,013.9	7,654.7	7,490.8	9,840.4	8,586.8	10,599.9	11,408.9
Revenues	$19,989.7	$17,854.1	$19,367.4	$19,259.8	$18,734.5	$25,364.9	$31,375.9	$30,366.0
GROUNDFISH								
Number Active**	30	27	15	21	24	26	18	9
Landings	35.3	33.9	211.7	119.0	397.7	407.5	431.1	828.8
Revenues	$37.8	$37.5	$280.2	$159.3	$555.6	$496.5	$455.4	$817.9
Multispecies Revenues as a percent of Total Revenues	0.2%	0.2%	1.4%	0.8%	3.0%	2.0%	1.5%	2.7%

Table 719 - Fishing Activity for Vessels Homeported in Virginia

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

C ("confidential") *indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases.

9.4.5.16 North Carolina

McCAY AND CIERI – The McCay and Cieri Report provides detailed profiles of fishing ports in the state of North Carolina. This includes ports of Wanchese, Morehead City, Beaufort, Ocracoke, and Hatteras. The report also includes several island communities in North Carolina such as Pamlico, Albemarle, Core, and others. These profiles should be referenced for social and demographic data not contained in this document.

NORTH CAROLINA	1990		2000		Percent change
Population (total individuals)	6,628,637		8,049,313		21.4%
Educational attainment (percent persons 25 yrs and over, high school graduate or higher)	70.0%		78.1%		Difference = 8.1%
Poverty* (Number of families)	179,906		196,423		9.2%
Unemployment (Pop. 16 yrs and over)	Unemployed	Percent of civilian labor force	Unemployed	Percent of civilian labor force	
	163,081	4.8%	214,991	5.3%	31.8%

Table 720 - Population, education, poverty and unemployment statistics for the state of North Carolina (1990 and 2000)

** data shown for 1989 and 1999*

Data source: U.S. Census Bureau

The total population in North Carolina increased by 21.4% from 1990 to 2000 (Table 720). The percentage of individuals 25 years and older who graduated from high school or higher secondary school increased by 8.1 percentage points over the course of a decade, from 70% in 1990 to 78.1% in 2000. The number of families below the poverty level increased 9.2% from 1989 to 1999. The number of unemployed increased almost 32% over the decade, while the unemployment rate increased from 4.8% to 5.3% of the civilian labor force, aged 16 years and older.

Geographic area	Total population	Race								
		One race							Two or more races	Hispanic or Latino(of any race)
		Total	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some other race		
NORTH CAROLINA	8,049,313	7,946,053	5,804,656	1,737,545	99,551	113,689	3,983	186,629	103,260	378,963

Table 721 - Population by race in North Carolina, 2000

Counties examined in Fishing Communities section of AHE in bold type.

Data source: U.S. Census Bureau

In 2000, the total population of North Carolina was 72.1% white, 21.6% black/African American, 1.4% Asian, 1.3% of two or more races, 2.3% other races, and 4.7% Hispanic/Latino of any race (Table 721).

Fishing Industry Employment in North Carolina

North Carolina reported more fishing establishments than Delaware, Virginia, or Maryland. This number increased slightly over the period, from 3,367 in 1997 to 3,574 in 2001 (Table 722). The average payroll for participants in the fishing sector was $32,960 in 2000. The fish and seafood wholesale sector, which reported the second greatest number of establishments after the fishing sector, decreased from 97 establishments to 84. Fish and seafood markets increased over the period, while seafood product preparation and packaging establishments fluctuated, fresh and frozen seafood processing establishments declined, and seafood canning establishments remained stable.

NAICS Code and Description		1997	1998	1999	2000	2001
1141* Fishing	Sum of Total Establishments	3,367	3,301	3,460	3,574	NA
	Sum of Annual payroll	93,806	96,765	104,133	117,799	NA
3117** Seafood product preparation and packaging	Sum of Total Establishments	NA	33	27	32	27
	Sum of Annual payroll	NA	2,357	1,699	4,529	1,511
311711** Seafood canning	Sum of Total Establishments	NA	2	1	2	2
	Sum of Annual payroll	NA	E	E	E	E
311712** Fresh and frozen seafood processing	Sum of Total Establishments	NA	31	26	30	25
	Sum of Annual payroll	NA	E	1,699	4,529	E
42246** Fish and seafood wholesale	Sum of Total Establishments	NA	97	90	86	84
	Sum of Annual payroll	NA	15,762	17,100	16,058	10,778
44522** Fish and seafood markets	Sum of Total Establishments	NA	64	66	61	70
	Sum of Annual payroll	NA	1,218	1,203	1,060	1,160

Table 722 - Employment in fishing and related industries in North Carolina (1997-2001)

** from Nonemployer Statistics database*
*** from County Business Patterns database*
*Annual payroll reported in thousands of dollars, **not** adjusted for inflation.*
NAICS = North American Industry Classification System
***D** = withheld to avoid disclosing data for individual businesses; data are included in broader industry totals*
***E** =reported as zero, may be in error or <$1,000*
***NA** = not applicable*
Data source: U.S. Census Bureau – Nonemployer Statistics (NES) and County Business Patterns (CBP)

Fishing Activity in North Carolina

By Port of Landing

The number of active multispecies vessels landing fish in North Carolina increased from 1996 to 1999, the years for which the only data were available. Vessels landing groundfish fluctuated in number, dropping to zero in 1997 and never exceeding a maximum of 13 in 1998 (Table 723). Total landings increased from around 7 million pounds in 1996 to 11.1 million pounds in 2001. Groundfish landings were very low throughout the period, with maximum reported landings in any year of 2,200 pounds (1998). Landings of other species comprised the majority of total landings in North Carolina.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Active Multispecies Vessels	Not Avail.	Not Avail.	85	97	92	113	Not Avail.	Not Avail.
Number of Multispecies Vessels Landing Groundfish	Not Avail.	Not Avail.	3	0	13	6	Not Avail.	Not Avail.
TOTAL								
Landings	Not Avail.	Not Avail.	7,008.2	10,140.5	11,202.3	11,647.9	11,009.9	11,140.3
Revenues	Not Avail.	Not Avail.	$3,449.6	$7,919.3	$8,012.0	$11,136.2	$10,749.9	$7,601.1
GROUNDFISH								
Landings	Not Avail.	Not Avail.	0.7	1.7	2.2	0.4	0.1	1.5
Revenues	Not Avail.	Not Avail.	$0.9	$1.2	$1.6	$0.2	$0.1	$0.8
SMALL MESH MULTISPECIES								
Landings	Not Avail.	Not Avail.	C	0.1	C	C	C	C
Revenues	Not Avail.	Not Avail.	C	$0.0	C	C	C	C
SMALL MESH NON-MULTISPECIES								
Landings	Not Avail.	Not Avail.	177.2	1,117.1	969.6	231.2	46.7	119.5
Revenues	Not Avail.	Not Avail.	$43.3	$198.8	$174.4	$54.8	$24.0	$48.8
OTHER SPECIES								
Landings	Not Avail.	Not Avail.	6,816.2	8,951.6	10,129.7	11,397.4	10,881.1	10,637.1
Revenues	Not Avail.	Not Avail.	$3,362.3	$7,350.0	$7,381.0	$10,994.2	$10,456.8	$6,454.5
HIGH VALUE SPECIES								
Landings	Not Avail.	Not Avail.	13.5	69.9	100.4	18.7	81.9	382.1
Revenues	Not Avail.	Not Avail.	$42.7	$369.2	$454.7	$87.1	$269.0	$1,097.1

Table 723 - Landings and Revenues from Multispecies Permit Holders in North Carolina (Dealer Activity)

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

Groundfish includes cod, haddock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, pollock, redfish and white hake.

Small Mesh Multispecies includes silver hake, red hake, offshore hake, and ocean pout.

Small Mesh Non-Multispecies includes butterfish, herring, mackerel, scup, shrimp, loligo and illex squid.

Other Species includes monkfish, fluke, dogfish, skates, cusk and all other species.

High Value Species includes bluefin tuna, bigeye tuna, yellowfin tuna, American lobster, and sea scallops.

C ("confidential") **indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.**

Data source: NMFS Permit and Dealer databases

By Homeport

The number of permitted multispecies vessels homeported in North Carolina far exceeded the number of multispecies landing fish in that state, increasing from 66 in 1994 to 94 in 2001 (Table 724). The number of active vessels nearly doubled during that period, while the number of vessels landing groundfish fluctuated, with a reported 27 vessels in the first and last years of the time series. Total landings nearly tripled from 1994 to 2001, and groundfish landings demonstrated a 19-fold increase, from 66,200 pounds in 1994 to 1.3 million pounds in 2001. Groundfish dependence in North Carolina is higher than in other mid-Atlantic states, averaging 2.8% from 1994 to 2001 with some fluctuation throughout that period.

Fishing Year	1994	1995	1996	1997	1998	1999	2000	2001
Number of Permitted Multispecies Vessels	66	71	81	71	71	75	85	94
TOTAL								
Number Active*	46	35	59	55	59	60	69	78
Landings	6,883.1	6,438.9	10,726.7	13,548.5	16,427.4	15,639.0	16,253.9	18,972.3
Revenues	$4,534.3	$4,032.7	$7,376.2	$10,524.3	$12,776.6	$17,753.7	$21,473.2	$20,658.4
GROUNDFISH								
Number Active**	27	17	13	16	20	17	18	27
Landings	66.2	11.3	15.0	321.5	732.0	359.7	797.7	1,254.3
Revenues	$66.9	$7.4	$17.6	$320.9	$765.0	$427.1	$847.6	$1,112.8
Multispecies Revenues as a percent of Total Revenues	1.5%	0.2%	0.2%	3.0%	6.0%	2.4%	3.9%	5.4%

Table 724 - Fishing Activity for Vessels Homeported in North Carolina

Landings are in thousands of pounds and revenues are in thousands of 1999 dollars.

** Denotes the number of permitted multispecies vessels reporting landings of any species.*

*** Denotes the number of permitted multispecies vessels reporting landings of groundfish species.*

***C ("confidential")** indicates that landings/revenues are for less than three vessels and cannot be reported for confidentiality reasons.*

Data source: NMFS Permit and Dealer databases.

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